CASIO

IT-9000 Series

Software Manual

(Version 1.00)

CASIO Computer Co., Ltd.

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Editorial Record

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Preview

The features and specifications described in this reference manual give you the functional detail of the software integrated in the IT-9000 series handheld terminals with Microsoft Windows Mobile® Version 6.5 OS.

1. Product Overview

1.1 Model by Feature

The major features integrated in each model of the IT-9000 series are shown below.

Table 1.1

Model no.	Printer	Image Scanner	MCR	W-WAN GPS	W-LAN (802.11 b/g)	Camera	NFC	Extnsion Slot
IT-9000-05E	Yes	-	-	-	Yes	-	Yes	-
IT-9000-05E-CN	Yes	-	-	-	Yes	-	Yes	-
IT-9000-G05E	Yes	-	-	Yes	Yes	-	Yes	-
IT-9000-GMC25E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
IT-9000-25E	Yes	Yes	-	-	Yes	-	Yes	-
IT-9000-G25E	Yes	Yes	-	Yes	Yes	-	Yes	-
IT-9000-GC25E	Yes	Yes	-	Yes	Yes	Yes	Yes	-
IT-9000-GM35E	Yes[*1]	Yes	Yes	Yes	Yes	-	Yes	-
IT-9000E-MC25E	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes
IT-9000E-C25E	Yes	Yes	-	-	Yes	Yes	Yes	-

Notes:
- *1   82.55mm   Other model=80mm
- Model with "-CN" at the end of its model number is for China.
- Model with "-MC25E/-C25E" at the end of its model number is for USA and Canada.

1.2 Available Options

The following dedicated options are available for IT-9000 series.

Table 1.2

Option	Product	Model no.	Remark
Cradle	USB Cradle	HA-L60IO HA-L60IO-CN	
	Ethernet Cradle	HA-L62IO HA-L62IO-CN	
Battery	Battery Pack	HA-G20BAT	
Battery charger	Dual Battery Charger	HA-G32DCHG	
	Cradle-type Battery Charger	HA-L30CHG HA-L30CHG-CN	
	Car Mounted-type Battery Charger	HA-H35CHG	With Car power Cable
AC adaptor (for HA-L60IO, HA-L62IO, HA-L30CHG,)		AD-S42120C-N5	Without power cable accompanied
Cable	USB cable	DT-380USB-A	To connect cradle to PC
	USB cable (Host)	HA-L80USBH HA-L80USBH-CN	
	USB cable (Client)	HA-L81USBH HA-L81USBH-CN	
	USB-Serial cable	HA-L82RSC HA-L82RSC-CN	

Note:

"-CN" attached at the end of model number denotes that the model is dedicated for the final destination of China. A note about compliance with the Chinese "RoHS" requirement promulgated by the Ministerial Decree No. 39 is accompanied in the carton box; the RoHS compliant seal is affixed on the body and the seal of the packing material recycle marking is affixed on the carton box.

2.　Functions

This chapter describes about detailed specifications of the functions implemented in the terminal and the dedicated options.

2.1　Basic Specifications

This chapter describes about the basic specifications of the functions implemented in the terminal.

2.1.1　Windows Mobile® 6.5

The terminal integrates Microsoft® Windows Mobile® Version 6.5 as its operating system. The operating system features with the following capabilities.

- Windows CE 5.0 based kernel
- Improved virtual memory control method
- UI with new touch panel
- MyPhone service which can synchronize and share schedule, contacts, and pictures via WEB
- Marketplace which can search and purchase mobile application
- InternetExploreMobile6 (based on IE6.0)
- RemoteDesktopMobile
- Open environment to easy development
- High speed processing possible due that many programs such as the OS module, the basic driver, and font file, etc. required for applications to run are transferred to the RAM from NAND disk.

Other Microsoft applications such as PocketWord and PocketExcel are not bundled.

2.1.2 Display

Basic Specifications

The VGA (480 x 640 dots) display mode is supported in the terminal.

Table 2.1

Specification		65,536 colors 2-way TFT LCD* (16 bpp, Red: 5 bits, Green: 6 bits, Blue: 5 bits)
Display size (Large)	X direction	480 dots
	Y direction	640 dots
Display size (Standard)	X direction	240 dots
	Y direction	320 dots

Switching VGA and QVGA

The Windows Mobile OS integrated in devices including the Casio IT-9000 cannot switch the display mode, from VGA to QVGA and vice versa, due to Microsoft requirement. This limits that the display resolution with the OS is VGA mode only.
However, the Windows Mobile OS features extended display function which offers various display modes detailed in the table.

Table 2.2

Specification of Display Resolution in Application		Display condition
Not specified		Display in QVGA mode with doubled size in X and Y directions.
Yes, specified	QVGA	Display in QVGA mode with doubled size in X and Y directions.
	VGA	Display in VGA mode as is.

Backlight Brightness

- Brightness of the backlight can be adjusted at the Control Panel, or using the relevant functions of the System Library.
- Brightness setting can be made in one of nine grades for power source either when the power is provided by an external power supply (by AC Adaptor connected via cradle, or AC Adaptor directly connected) or when the power is provided by the installed lithium-ion battery pack.
- Brightness setting can be made in application by using **ExtEscape()API** function.
- If the brightness is set to 1 (minimum), the backlight is turned off.
- With the power source by the installed lithium-ion battery pack, the system automatically controls the brightness at 50% level to curve power consumption. This does not require the running application to aware of the brightness control.
- The default is 9 (maximum) when an external power source is used or 7 when the lithium-ion battery pack is used.

The functions of the System Library relevant to the Backlight Brightness are as follows.

SysGetBLBattery	:	Retrieves brightness of the screen when the power is supplied by battery pack.
SysSetBLBattery	:	Sets up brightness of the screen for the power source supplied by battery pack.
SysSetBLExpower	:	Sets up brightness of the backlight for the power source supplied by external power.
SysGetBLExpower	:	Retrieves brightness of the backlight when the power is supplied by external power.
SysGetBLMaximum	:	Retrieves the maximum value of brightness for the backlight.

Backlight Auto Dimming

The brightness at the Control Panel can be used to set up whether or not the Auto Dimming function is used and the waiting time until when dimming begins. The auto dimming is set effect only when the power is provided by the lithium-ion battery pack. It will not activate when an external power supply is used.

- If the terminal is left unused in idle state - absolutely no key input is made - while the power is turned on, the backlight will be automatically dimmed to save the power after a given period of time has been elapsed.
- While the terminal is being in the auto dimmed state, pressing key disables the auto dimming function and then resumes the ordinary brightness.
- While the Auto Dimming function has been set effect, the brightness can be set in one of eight grades. The default is 3. During the Auto Dimming function being set effect, the brightness cannot be set any brighter than the brightness illuminated by the backlight. The defaults are "Enable the auto dimming function" and "1 minute" for waiting time period until when the Auto Dimming function activates.

Auto Backlight OFF

The brightness at the Control Panel can be used to set up whether or not the Auto Backlight OFF function will be used and the waiting time until when the Auto Backlight OFF function activates. The Auto Backlight OFF function is operable for both when the power is provided by an external power source and when it is provided by the lithium-ion battery pack.

- If the terminal is left unused in idle state - absolutely no key input is made - with the power being turned on, the backlight will be automatically turned off to save the power.
- When the terminal is in the Auto Backlight OFF state, pressing a key disables the Auto Backlight OFF function and resumes the ordinary brightness.
- While the power is being provided by the lithium-ion battery pack and both the Auto Dimming function and the Auto Backlight OFF function have been set effect, either one of the functions with preset time period shorter than the other will have the priority. The default is "Enable the Auto Backlight OFF function" and "5 minutes for the waiting time" until when the Auto Backlight OFF function activates.

Flipping Display Screen

Flipping display screen at 90, 180 or 270 degree is supported.

- The relevant functions of the System Library can be used to set up an angle to flip the screen in application.
- With **ChangeDisplaySettingEx() API** function, flipping display screen at 90, 180 or 270 degree can be set in application.

See Microsoft Help for detail about **ExtEscape()** and **ChangeDisplaySettingEx() API** functions.

The functions of the System Library relevant to the Flipping Display Screen are as follows.

SysSet180Rotate   : Sets up angle to flip the screen.
SysGet180Rotate   : Retrieves the status of angle for flipping the screen.

Restrained Backlight Brightness by Temperature Sensor

When temperature in the terminal becomes extremely high, the backlight brightness is restrained. There are two stages to restrain the brightness. In first stage, setting up the brightness is limited to the range of 1 to 7 instead of the range 1 to 9. In second stage, setting up the brightness is further restrained to the range of 1 to 5.

If the brightness set in ordinary brightness or in a specific range with the Auto Dimming function (effect only when power source is supplied by the lithium-ion battery pack) is any brighter than the limited range affected by high temperature, the brightness is automatically adjusted to the maximum brightness in the limited range. However, the brightness resumes automatically its brightness when the temperature becomes lower.

2.1.3 Touch Panel

An input can be made to any portion of the touch panel. The touch panel has the following resolutions.

Table 2.3

High Resolution	X direction	480 dots
	Y direction	640 dots
Resolution	X direction	240 dots
	Y direction	320 dots

- Capturing touch coordinates in X and Y directions and controlling the pointing are possible by application. Prior to using the touch panel for the very first time, calibrating the touch panel is required.

Tap Sound

The Control Panel can be used to set up tap sound in mute, low or loud.

Tap and Hold

By tapping and holding a specific object on the screen, the related pop-up menu appears.

Flipping Touch Panel Coordinates

When the screen flips, the coordinates of the touch panel also flip in unison.

Calibrating Touch Panel

Calibration on the touch panel can be initiated either using the Welcome wizard appeared after disk clean or by simultaneously pressing Fn and 4 keys.
The touch panel may require a periodical calibration if it slips off due to aged deterioration, voltage fluctuation, temperature change, etc. If it occurs on the screen of your terminal, perform the calibration by initiating one of the methods.

2.1.4 Keys

Keyboard Layout

The following is the keyboard layout employed in the terminal.
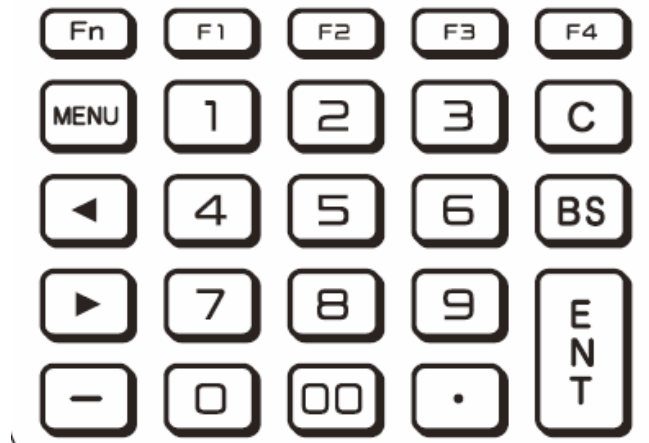
Figure 2-1

Key Assignments

The following are the key codes and function assignments.

Table 2.4 Control keys

KEY	Input mode		Operation	Remarks
Fn	----		Specialized key operation (toggle).	Fn mode is released when a key input is made.
C	Character input mode	1	Performs as ESC key.	
		A	Performs as ESC key.	
		a	Performs as ESC key.	
	Function mode	F	NOP	
BS	Character input mode	1	Deletes one character to the left.	
		A	Deletes one character to the left.	
		a	Deletes one character to the left.	
	Function mode	F	NOP	
MENU	Character input mode	1	Perform as MENU key.	
		A	Perform as MENU key.	
		a	Perform as MENU key.	
	Function mode	F	Start the application.	
ENT	Character input mode	1	Performs as Enter key.	
		A	Performs as Enter key.	
		a	Performs as Enter key.	
	Function mode	F	NOP	
←	Character input mode	1	Perform as "Cursor left key".	
		A	Perform as "Cursor left key".	
		a	Perform as "Cursor left key".	
	Function mode	F	NOP	
→	Character input mode	1	Perform as "Cursor right key".	
		A	Perform as "Cursor right key".	
		a	Perform as "Cursor right key".	
	Function mode	F	Feed the printer paper.	
- (hyphen)	Character input mode	1	Performs as - key.	
		A	Performs as - key.	
		a	Performs as - key.	
	Function mode	F	Switch over the input mode. Numeric→ Alphabet(U)→ Alphabet(L)	

Table 2.5 Function keys

KEY	Input mode		Operation	Remarks
F1	Character input mode	1	Performs as F1 key.	
		A	Performs as F1 key.	
		a	Performs as F1 key.	
	Function mode	F	Performs as Shift and F1 key.	

F2	Character input mode	1	Performs as F2 key.	
		A	Performs as F2 key.	
		a	Performs as F2 key.	
	Function mode	F	Performs as Shift and F2 key.	
F3	Character input mode	1	Performs as F3 key.	
		A	Performs as F3 key.	
		a	Performs as F3 key.	
	Function mode	F	Performs as Shift and F3 key.	
F4	Character input mode	1	Performs as F4 key.	
		A	Performs as F4 key.	
		a	Performs as F4 key.	
	Function mode	F	Performs as Shift and F4 key.	

Table 2.6a   Program keys

KEY	Input mode		Operation	Remarks
Program Key L	Character input mode	1	R Program key	
		A	R Program key	
		a	R Program key	
	Function mode	F	R Program key	
Program Key R	Character input mode	1	L Program key	
		A	L Program key	
		a	L Program key	
	Function mode	F	L Program key	

Table 2.7   Ten key

Key	Input mode			Operation	Remark
00	Character input mode	1		Performs as 00 key.	
		A		Performs as "-_ / ^\&=+$%#* space €" keys.	
		a		Performs as "-_ / ^\&=+$%#* space €" keys.	
	Function mode	F		NOP	
0	Character input mode	1		Performs as 0 key.	
		A		Performs as "0123456789" keys.	
		a		Performs as "0123456789" keys.	
	Function mode	F		Displays SIP or does not display.	
1	Character input mode	1		Performs as 1 key.	
		A		Performs as "?!()<>[]{}@" keys.	
		a		Performs as "?!()<>[]{}@" keys.	
	Function mode	F		Turns on or off the backlight.	
2	Character input mode	1		Performs as 2 key.	
		A		Performs as "A", "B" and "C" keys.	
		a		Performs as "a", "b" and "c" keys.	
	Function mode	F		Turns on or off the key backlight.	
3	Character input mode	1		Performs as 3 key.	
		A		Performs as "D", "E" and "F" keys.	
		a		Performs as "d", "e" and "f" keys.	
	Function mode	F		NOP	
4	Character input mode	1		Performs as 4 key.	
		A		Performs as "G", "H" and "I" keys.	
		a		Performs as "g", "h" and "i" keys.	
	Function mode	F		Start the screen of Mouse Properties	
5	Character input mode	1		Performs as 5 key.	
		A		Performs as "J", "K" and "L" keys.	
		a		Performs as "j", "k" and "l" keys.	
	Function mode	F		Darkens the backlight.	
6	Character input mode	1		Performs as 6 key.	
		A		Performs as "M", "N" and "O" keys.	
		a		Performs as "m", "n" and "o" keys.	
	Function mode	F		Brightens the backlight.	
7	Character input mode	1		Performs as 7 key.	
		A		Performs as "P", "Q", "R" and "S" keys.	
		a		Performs as "p", "q", "r" and "s" keys.	
	Function mode	F		Start the application.	
8	Character input mode	1		Performs as 8 key.	
		A		Performs as "T", "U" and "V" keys.	
		a		Performs as "t", "u" and "v" keys.	
	Function mode	F		Start the application.	
9	Character input mode	1		Performs as 9 key.	

		A	Performs as "W", "X", "Y" and "Z" keys.	
		A	Performs as "w", "x", "y" and "z" keys.	
	Function mode	F	Start the application.	
. (Decimal point)	Character input mode	1	Performs as "." key.	
		A	Performs as "@.,""`:;~|" keys.	
		a	Performs as "@.,""`:;~|" keys.	
	Function mode	F	Performs as "-" key.	

Switch Over Key Input Mode

The **"Fn"+"-"** key on the keyboard can be used to change the key input mode.

The functions of the System Library relevant to the "Key Input Mode Switchover" are as follows.

SysSetEnableKeyMode : Sets up "Enable" or "Disable" for key mode transition when the key input mode is changed

SysGetEnableKeyMode : Retrieves the status of "Enable" or "Disable" for key mode transition when the key input mode is changed.

Indication of Key Input Mode

Key input mode currently specified appears in the Title bar. The modes that can be displayed are "1" as numeral, "A" as alphabets in uppercase letter, and "a" as alphabets in lowercase letter.

Figure 2-2

Turnover Key Auto Confirmation

After pressing a turnover key, if the preset time period has been elapsed from the time when the turnover key is released, the turnover character input will be automatically made. The Control Panel can be used to set up "Enable" or "Disable" for the auto confirmation on the turnover character input and to set up the time period until when its confirmation is made.

Key Repeat

Continuously pressing any one of the "0" to "9", "←" and "→" keys repeats the key input.

Key Click Sound

The key click sound is generated when a key is pressed. However, it is not generated when the key is released or in mid-course of repeating the key input. The Control Panel can be used to set up the sound to mute, low or loud.

Enabling or Disabling Fn Key operation

For keys that perform specialized operations while the key input mode has been set to Function mode, "Enable" or "Disable" can be set on each individual key in the registry below to control the operations.

[HKEY_LOCAL_MACHINE\HARDWARE\DEVICEMAP\KEYBD]

Or, using the **SysSetFnKeyOperation** function of the System Library can achieve the same control operation explained above.

Table 2.8

Key	Setting Value	Meaning
DisableFn9	dword: 0 or 1	Enable or Disable
DisableFn8	dword: 0 or 1	Enable or Disable
DisableFn7	dword: 0 or 1	Enable or Disable
DisableFn6	dword: 0 or 1	Enable or Disable
DisableFn5	dword: 0 or 1	Enable or Disable
DisableFn4	dword: 0 or 1	Enable or Disable
DisableFn3	dword: 0 or 1	Enable or Disable
DisableFn2	dword: 0 or 1	Enable or Disable
DisableFn1	dword: 0 or 1	Enable or Disable
DisableFn0	dword: 0 or 1	Enable or Disable
DisableFnMenu	dword: 0 or 1	Enable or Disable

The functions of the System Library relevant to the "Enabling or Disabling Fn Key" are as follows.

SysSetFnKeyOperation : Sets up "Enable" or "Disable" for the Fn key operation.
SysGetFnKeyOperation : Retrieves "Enable" or "Disable" status for the Fn key operation.

Function Mode Notification

When the Fn key is pressed, the WM_USER+0x502 message is issued to application. This enables the application to detect whether the Function mode has been set up enabled or disabled.

Enable or Disable the Key Input Mode Switchover.

The System Library can be used to make the setting on "Enable" or "Disable" for switching over the key input mode in application.

The functions of the System Library relevant to the "Enable or Disable the Fn Key" are as follows.

SysSetFnKeyLock : Sets up "Enable" or "Disable" for the Fn key to activate.
SysGetFnKeyLock : Retrieves "Enable" or "Disable" status for the Fn key to activate.

Fn and "-" Keys Notification

When the Fn and "-" keys are pressed, the WM_USER+0x506 message is issued to application. Using this notification, the application can detect whether the key input mode has been changed.

Enable or Disable Key Locks

The System Library can be used to enable or disable the operations of keys except for the Power and Program keys.

The functions of the System Library relevant to the "Permit or Prohibit Key Locks" are as follows.

SysSetAllKeyLock : Sets up "Enable" or "Disable" for lock with specified key.
SysGetAllKeyLock : Retrieves "Enable" or "Disable" status for lock with specified key.

Keys User Can Set

Initiating application
The following registry can be used to assign any application to the Fn+7, Fn+8, Fn+9 and Fn+Menu keys.

[HKEY_LOCAL_MACHINE\HARDWARE\DEVICEMAP\KEYBD]

Table 2.9

Key	Setting Value
Fn7LaunchPath	sz: the full path of target application to initiate.
Fn8LaunchPath	sz: the full path of target application to initiate.
Fn9LaunchPath	sz: the full path of target application to initiate.
FnMENULaunchPath	sz: Target application in full path to initiate

- Setting Key Codes

The System Library can be used to assign any key code to all the keys except the Fn key. Setting "Enable" or "Disable" for assigning key code is possible using the System Library or at the Control Panel.

The functions of the System Library relevant to the "Setting Key Codes" are as follows.

SysSetNormalUserDefineKey : Sets up key codes (in normal mode).
SysGetNormalUserDefineKey : Retrieves key codes (in normal mode).
SysSetUserDefineKey : Sets up user defined keys
SysGetUserDefineKey : Retrieves user defined keys

- The key codes after setting are valid only when the numeral input mode is set effect.

2.1.5 Audio

Basic Specifications

WAV playback, voice recording and playback are supported.
By using the Microsoft **SoftwareMixer** function, output sounds from multiple applications can be mixed and output (in 44.1 KHz, 16-bit stereo mixing).
Voice Recorder is integrated in the terminal as the sound system application to make it possible to perform WAV file streaming playback and local file playback in HTTP.
Audio and Buzzer use the same integrated speaker, therefore it is not possible to playback Audio and Buzzer sound at the same time. In this case, Buzzer sound has the priority.

Playback

Table 2.10

Sampling frequencies	KHz	8	11.025	12	16	22.05	24	32	44.1	48
	Mono	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Stereo	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Sampling frequencies other than those above are not supported.									
Stereo/Monaural	8-bit or 16-bit In reality, the integrated monaural speaker does not output sound in stereo.									

Recording

Table 2.11

Sampling frequencies	KHz	8	11.025	12	16	22.05	24	32	44.1	48
	Monaural	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Sampling frequencies other than those above are not supported.									
Stereo/Monaural	8-bit or 16-bit Monaural sound input only via the microphone.									

Setting Sound Volume

The "Volume & Sound" at the Control Panel can be used to set up sound volume in six grades from loud to low and ON/OFF of mute. A sound volume also can be set up using **Win32 API** function in application.

Audio ON/OFF

The audio system can be disabled to save the power. "Enable" or "Disable" for the audio system in the terminal is controlled using the System Library in application.

The functions of the System Library relevant to the Audio ON/OFF are as follows.

SysAudioOff	:	Turns off the audio virtually with the audio turned off.
SysAudioOn	:	Turns on the audio virtually with the audio turned on.
SysGetAudioPowerState	:	Retrieves "Enable" or "Disable" status for turning off the audio virtually.

2.1.6 Buzzer Sound

Basic Specifications

The buzzer sound in various modes such as scanning confirmation, alarm, warning, and other available sounds can be output via the integrated speaker. The sounds have four attributes and default values.

Table 2.12

Sound Mode	Frequency (Hz)	Time (millisecond)	Individual Mute	Attribute
Alarm	3500	150	ON or OFF	B_ALARM
Warning	3000	100	ON or OFF	B_WARNING
Scan end	3300	75	ON or OFF	B_SCANEND
User designated	--	--	ON or OFF	B_USERDEF

Setting Volume

The "Buzzer" at the Control Panel can be used to set up volume in three grades from loud, medium, low and ON/OFF of mute. Setting the volume is also possible using the System Library in application.

The functions of the System Library relevant to the Setting Volume are as follows.

SysPlayBuzzer	: Sounds the buzzer.
SysStopBuzzer	: Turns off the buzzer's sound.
SysSetBuzzerVolume	: Sets up sound volume of the buzzer.
SysGetBuzzerVolume	: Retrieves sound volume of the buzzer.
SysSetBuzzerMute	: Sets up sound volumes for all the parameters and individual mutes.
SysGetBuzzerMute	: Retrieves the statuses of all the sound volumes and individual mutes.

2.1.7 Memory Management

The high speed and large capacity RAM (MobileDDR 256MB) and FlashROM (OneNAND Flash 256MB) are integrated in the terminal.
Although RAM has been used for RAM XIP (for OS), program memory (for program files to run) and object store (for storage of work data) in the previous Casio handheld terminals introduced in the past, non-volatile memory (FlashROM) is integrated to the Root folder in the terminal.

Your observation is required for the new method adopted in the terminal to manipulate the memory different from the previous Casio handheld terminals.

Notes:
- Patch file, program file and data are not lost even if the battery pack runs down. It is no longer needed to back up object store in the RAM.
- Although performing a full reset initializes object store (RAM) in the previous Casio handheld terminals, the new method initializes the RootDisk in the terminal.
- Formatting the UserDisk initializes registry, program file, and data to their factory defaults.
- UserDisk is divided into two blocks, RootDisk and FlashDisk. In the RootDisk, system file, registry, and patch driver, etc. are stored while backup data of backup tool and recovery tool are stored in the FlashDisk. This makes recovery of data from the FlashDisk possible in case of malfunction on the system.

RAM

The integrated RAM with a total capacity of 256MB is used for the below purposes.
- DriverGlobal and buffer : Work area for driver, etc.
- OS area : Area to deploy the OS to run.
- Program memory : Program execution area including work area for the OS.

- The **DriverGlobal** is a fixed area allocated for work area of drivers. The camera buffer used in the digital camera integrated models deploys captured image data temporarily.
- The OS files are deployed from the Kernel of the FlashDisk to the RAM in the terminal. This allows the OS to run quickly on the RAM. However, it takes time to deploy the OS files from the FlashDisk to the RAM in case when booting takes place after a full reset is performed or the lithium-ion battery runs down.
- Object store equivalent of the RAM disk in the previous Casio handheld terminals is no longer integrated. If files are copied to Root and Windows folder under "My device" folder, this creates the same files in the UserDisk of FlshROM and secures data without performing backup in case the lithium-ion battery is not installed.
- Although performing a full reset (all memory clear) deletes object store (RAM) in the previous Casio terminals, it deletes the RootDisk causing registry and system DB to be deleted and to initialize the system.
- This does not allow to change the ratio between program memory and object store at the Control Panel.

FlashDisk

The FlashDisk has a total capacity of 256MB and is used for the below purposes.

- Boot area   : Deploys the OS files to the RAM from the OS disk.
- OS disk/Kernel   : Stores the OS files. Boot loader is deployed in the RAM at time of booting.
- User disk   : A disk user can freely use. It comprises the RootDisk which is mounted in the system root folder and the FlashDisk.
- Spare   : A substitution sector of the FlashROM

- In the boot area, boot loader and etc. are stored to deploy the OS files/Kernel into the RAM.
- In the OS disk, the OS module, drivers, integrated applications and etc. are stored.
- The UserDisk different in its structure from RAM does not require a power to back up data in the disk, so data is not lost even if the terminal's memory backup battery runs down.
- The FlashDisk is observed as \FlashDisk driver under "My Device" and stores backup data used to restore the system to the same condition before unstable condition occurs. Data stored in the FlashDisk for restoration is not deleted by performing a full reset.
- Formatting the UserDisk deletes registry, patch files, program files and data, and initializes the system to the factory default.

Note:
Formatting on the UserDisk is carried out by a dedicated format tool in the Windows folder or by operating special keys. See the next chapter concerning the special keys operation.

2.1.8 Reset

The role of the boot loader in Windows Mobile (OAL) is to boot the OS after initializing the hardware. On the terminal, it is possible to carry out the special performances with special keys operation as described in the figure below.
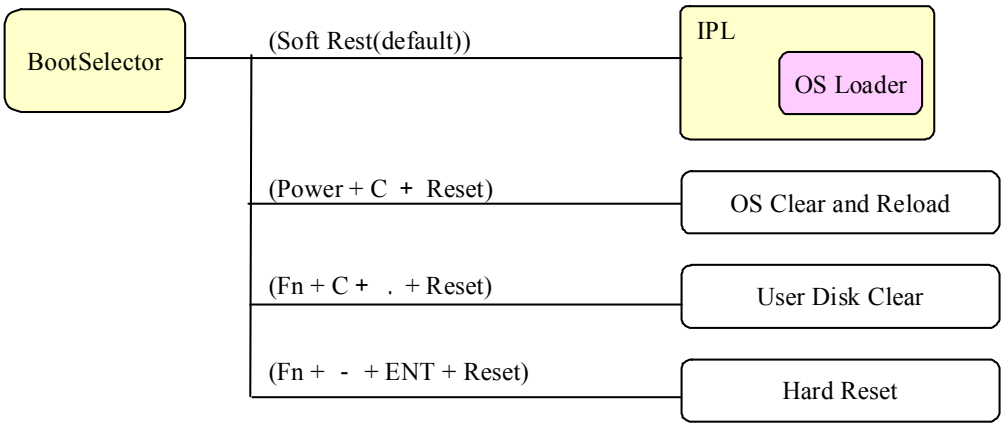
BootLoader of IT-9000

Figure 2-3

To reset the terminal, there are several ways to carry out it. The explanation below describes the methods to reset the terminal. See also Table 2.13.

Soft Reset

The operation requires pressing the reset switch on the back of the terminal. It initializes the program memory.

Full Reset

This operation is carried out if Power and C keys are held down at the same time and then the reset switch is pressed for a period of one second or longer. It initializes RAM and formats the RootDisk and reloads the OS again from the OS disk to the RAM.

Hard Reset

This operation is carried out if Fn and "-" and ENT keys are held down at the same time and then the reset switch is pressed. The RAM and Clock (RTC) are initialized and the OS files are reloaded into the RAM.

User Disk Clean

This operation is carried out if Fn and C and "." keys are held down at the same time and then the reset switch is pressed for a period of one second or longer that formats the RootDisk and FlashDisk and initializes the RAM to the factory default and then reloads the OS files to the RAM.
A message (see Figure 2.4) to confirm memory initialization appears. The R Program key is used to confirm the User Disk Clean.

Figure 2-4

After the R Program key is pressed twice, the UserDisk is formatted and the RAM is initialized to the factory default (see note).
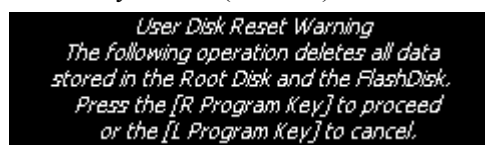

Figure 2-5

Notes:
- Distributor ID in E2PROM is not cleared by performing the **User Disk Clean**.
- The utility to carry out the **User Disk Clean** is available. See "DSKClean" for detail.

Power-on Reset

This is a state occurred on the terminal after the battery pack and memory backup battery are demounted and then put back into the terminal and then the Power switch is turned on for the first time. When the Power switch is turned on in this state, the Boot Loader performs reloading the OS files (RTC is initialized if it is necessary).

The table shows the respective states and data in the components and devices when the reset occurs.

Table 2.13

| | RAM | | RootDisk | FlashDisk | Registry | Clock (RTC) | E2PROM | |
	OS Memory	Program Memory					Individual ID	Distributor ID
Soft Reset	No	Initialize	No	No	No	No	No	No
Full Reset	Reload	Initialize	Initialize	No	Initialize	No	No	No
Hard Reset	Reload	Initialize	No	No	No	Initialize	No	No
User Disk Clean	Reload	Initialize	Initialize	Initialize	Initialize	No	No	No
Power-on Reset	Reload	Initialize	No	No	No	No/Initialize	No	No

Note:
"No" in the table indicates that the content in memory is not initialized by the reset.

2.1.9 Memory Corruption Check

Checksum is carried out in order to detect whether the OS deployed in the memory is corrupted or not, and the OS is reloaded if it is necessary.

Table 2.14

	Confirm the checksum	OS load
On Soft Reset	Carried out	Carried out when error of checksum occurs.
On Full Reset, Hard Reset, User Disk Clean and Power-on Reset	-	Carried out
On Suspend and Resume (see notes)	No	No

Notes:
- The reason that the checksum is not carried out on suspending and resuming is for high-speed performance. But, memory corruption check is carried out to check if the RAM is in error status by any reason.
- The RAM corruption check is performed by writing fixed data (0x00 to 0xFF) into a fixed area (256 bytes area) in the RAM prior to performing the check, and the value written in the RAM is verified at a time of Resume. If an error is detected, warning message for memory corruption check is issued, and then reset is performed and the OS files are reloaded.

2.1.10 LED

Basic Specifications

There are two LEDs integrated in the terminal, one on the right side (Indicator 2) for the user notification and the other (Indicator 1) for charging battery complete notification.

Table 2.15

LED	Color	Description
Right side LED (Indicator 2)	Red	User notification (alarm), scanning bar code
	Green	Scanning bar code complete
	Blue	Connection established via Bluetooth
	Orange	Connection established via WLAN, WWAN or GPS
	Cyan	User defined
	Magenta	Connection established via ActiveSync
Left side LED (Indicator 1)	Orange	While charging battery pack.
	Green	Charging battery pack is complete.
	Red	Charging battery pack in error.

Notes:
- The user notification LED (Indicator 2) on the right side can be used to indicate various notifications by the OS and other notifications defined by the user.
- All colors available with the LED (Indicator 2) on the right side are indicated with the System Library.
- The charging battery complete LED (Indicator 1) on the left side cannot be controlled or manipulated for its ON/OFF state and any other colors with software.

User Notification (Alarm)

This indication mode is used for alarm notification and etc. The LED can be lit for a specific time with **CeSetUserNotification()API** function.

Table 2.16

Operating mode	Specification
Blink interval	ON in red for 1 second, OFF for 2 seconds
Continuous ON time	ON for 30 minutes (OFF when VDET is detected.)

Note:
Indication for scanning a bar code has the priority over other indications.

Scanning

This is used for notification of a scanning result which is controlled with the System Library.

Table 2.17

Operating mode	Specification	Attribute
Scanning complete	ON in green for a specified period of time, then OFF.	SCANOK
Scanning in error	ON in red for a specified period of time, then OFF.	SCANERR

Bluetooth Connection Status

This is used for notification of Bluetooth connection establishment status which is controlled with the System Library.

Table 2.18

Status Mode	Specification	Attribute
Connection established via Bluetooth	ON in blue for 1 second, OFF for 2 seconds	BT

Note:

Indication for scanning a bar code has the priority over other indications.

WLAN Connection Status

This is used for notification of WLAN connection establishment status which is controlled with the System Library.

Table 2.19

Status Mode	Specification	Attribute
Connection established via WLAN	ON in orange for 1 second, OFF for 2 seconds	WLAN

Notes:

- Indication for scanning a bar code has the priority over other indications.
- The indication color for WLAN status is the same with those used for WWAN and GPS statuses.

User Definition

This indication mode is used for other notifications freely defined by the user. The ON/OFF state and color to be lit can be controlled with the System Library.

Table 2.20

Status Mode	Specification
User definition	Color selection from red, green, blue, orange, cyan and magenta.
	Programmable for ON and OFF time periods
Continuous ON time period	30 minutes (OFF when VDET is detected)

Note:

Indication for scanning a bar code has the priority over other indications.

WWAN Connection Status

This is used for notification of WWAN connection establishment status.

Table 2.21

Status Mode	Specification	Attribute
WWAN established	ON in orange for 1 second, OFF for 2 seconds	WWAN

Notes:

- Indication for scanning a bar code has the priority over other indications.
- The indication color for WWAN status is the same with those used for WLAN and GPS statuses.

GPS Connection Status

This is used for notification of GPS connection establishment status.

Table 2.22

Operation mode	Specification	Attribute
GPS established	ON in orange for 1 second, OFF for 2 seconds	GPS

Notes:
- Indication for scanning a bar code has the priority over other indications.
- The indication color for GPS is the same with those used for WLAN and WWAN statuses.

ActiveSync Connection Status

This is used for notification of ActiveSync connection establishment status which is controlled with the System Library.

Table 2.23

Status Mode	Specification	Attribute
Connection established via ActiveSync	ON in Magenta for 0.5 second, OFF for 2.5 seconds	DISKACCESS

Note:

Indication for scanning a bar code has the priority over other indications.

The functions of the System Library relevant to the User Definition are as follows.

SysSetLED : Sets up "Enable" or "Disable" for turning on the LED.

SysGetLED : Retrieves "Enable" or "Disable" status for turning on the LED.

2.1.11 Vibration

Basic Specifications

The vibration can be set up for five different notifications.

Table 2.23

Notification	Vibration Pattern	Setting	Default
Alarm	Default	ON or OFF	OFF
Warning	Default	ON or OFF	OFF
Bar code scan complete	Default	ON or OFF	OFF
Wireless incoming signal	Default	ON or OFF	OFF
User definition	User	ON or OFF	OFF

Vibration Interval

The vibration interval can be set in two different patterns, the default setting and a user defined setting.

Table 2.24

Pattern	Vibration Interval	Remarks
Default	"ON for 1 second, OFF for 1 second" x ?? [times]	Maximum no. of times; 20
User definition	"Specified ON period, Specified OFF period" x ?? [times] Setting range; 1/16 seconds to 16 seconds for ON period, 1/16 seconds to 1 second for OFF period	Maximum no. of times; 20

SysPlayVibrator function of the System Library can be used to control ON/OFF state for each occasion of the vibration and the vibration interval in user definition.

The functions of the System Library relevant to the "Vibration Interval" are as follows.

SysPlayVibrator	: Turns on the vibration.
SysStopVibrator	: Turns off the vibration.
SysSetVibratorMute	: Sets up "Enable" or "Disable" for all the parameters for the vibration and individual mutes.
SysGetVibratorMute	: Retrieves statuses of all the parameters for the vibration and individual mutes.

2.2 CMOS Imager

This chapter describes about detailed specifications of the CMOS Imager which is model dependant. See Table 1.1 for the CMOS Imager integrated models.

2.2.1 Basic Specifications

The following industrial standard 1D symbologies are supported by the integrated CMOS Imager.

Table 2.25   1D bar code symbologies

Symbology	Minimum digits	Maximum digits	Check character	Check character output	Output format/Add-on function
EAN8	8 (+2/5)		Always Enable	Enable or Disable	2 digits/5 digits added-on
EAN13	13 (+2/5)		Always Enable	Enable or Disable	2 digits/5 digits added-on
UPC-A	12 (+2/5)		Always Enable	Enable or Disable	NS output 2 digits/5 digits added-on
UPC-E	6 (+2/5)		Always Enable	Enable or Disable	NS output UPCA conversion 2 digits/5 digits added-on
Code39	1	22	Enable or Disable	Enable or Disable	Output of start/stop bits Full ASCII conversion Add-on code
Codabar (NW7)	2	26	Enable or Disable	Enable or Disable	Output of start/stop bits
Interleaved 2of5 (ITF)	4	42	Enable or Disable	Enable or Disable	
Code93	1	35	Always Enable	Always Disable	
Code128, GS1-128	1	28	Always Enable	Always Disable	Code A/B
	1	56	Always Enable	Always Disable	Code C
MSI(Plessey)	4	26	Always Enable	Enable or Disable	
IATA	4	24	Always Enable	Always Disable	
Code11	1	40	Always Enable (2 digits)	Always Disable	
DS1 DataBar Omnidirectional (Standard/Truncated)	14		Always Enable	Always Disable	
GS1 DataBar Limited	14		Always Enable	Always Disable	

Continue.

GS1 DataBar Expanded (Standard)	1	40	Always Enable	Always Disable	
ISBT (note 1)	1	28	Always Enable	Always Disable	
Code32 (note 2)	9		Always Enable	Always Enable	

Notes:

1. ISBT symbology is decoded as Code128 symbology.
2. To read Code32 symbology, set also Code39 symbology enabled. When Code32 is enabled, Code39 which consists of specific data is converted to Code32.

Table 2.26   2D Stacked Code symbologies

Symbology	Minimum digits	Maximum digits	Check character	Check character output	Output format/Add-on function
Code49	1	81	Always Enable	Always Disable	
PDF417	1	2,000	Always Enable	Always Disable	
MicroPDF	1	366	Always Enable	Always Disable	
Codablock F (note1)	0	200	Always Enable	Always Disable	
EAN8/13 Composite	8	338	Enable	Disable	
GS1 Composite	2	338	Always Enable	Always Disable	
UCC/GS1-128 Composite	6	2,361	Always Enable	Always Disable	
TLC39 (note2)	-	279	Always Enable	Always Disable	
GS1 DataBar omnidirectional (Stacked type) included Standard Omni directional	14		Always Enable	Always Disable	
GS1 DataBar Expanded (Stacked type)	1	20	Always Enable	Always Disable	

Note:

1. Since Codablock F is a stacked code of the Coda128 symbology, a part of symbol of the Code128 symbology may be read if the Code128 symbology is set to "Enable".
2. TLC39 is the bar code which consists of Code39 abd add-on codes. When TLC39 is enabled, the reading performance of Code39 may deteriorate.

Table 2.27 2D Matrix Code symbologies

Symbology	Minimum digits	Maximum digits	Check character	Check character output	Output format/Add-on function
Aztec	1	2,000	Enable	Disable	
QR Code	1	1,500	Enable	Disable	
Micro QR Code	1	35	Enable	Disable	
Maxicode	1	138	Enable	Disable	
DataMatrix	1	1,000	Enable	Disable	ECC000/050/080/100/ 140/200
HanXin Code (Chinese Sensible Code)	1	1000	Enable	Disable	

Note:

The maximum numbers of digits listed in the above table apply to cases where the entire symbology consists of numeric characters only. The maximum number is reduced to two third (2/3) of each maximum no. of digits for alpha-numeric characters; and reduced to one third (1/3) for Kanji characters and binary numbers. These are merely reference, and the actual range of readable symbologies varies according to the conditions (resolution, PCS, etc.) of individual symbol and the surrounding environment.

2.2.2 Scanning Method

Ordinary Read

This function reads one bar code at a time and outputs the data. Ordinary, this read method is used.

Multi-step Read

This function continuously performs decoding as long as one of the R/L Trigger keys is held down. Once bar codes are decoded they are not read any more. This function is useful for reading all bar codes without repeating the same action when more than one bar code is printed on one slip.

Package Read

This function outputs the read result retrieved from more than one bar code in a package. With the multi-step read function, once bar codes are decoded they are not read any more. This is useful for handling multiple pieces of bar code data. However, if any of the following unfavorable conditions occur, all the bar codes may not be read in one capture:
- The objective bar code of read is not contained in the captured image.
- The focus is not sharp enough.
- The exposure is not correct.

Table 2.28   Difference between Multi-step and Package Reads

Performance	Multi-step Read Mode	Package Read Mode
Maxi. no. of bar codes to read (Max. no. of read steps)	10	10
Max. no. of digits to read	4,095	4,095 (see note below.)
Total no. of digits to read	4,095 x 10 = 40,950	4,095
Read method	Continuously reads the specified number of bar codes as long as the Program key is held down. Different from Package read in which multiple bar codes are read at a single scan, a single kind of a symbol will be continuously read through multi read steps. If one bar code is read, the buzzer sounds and the LED turns on.	Multiple bar codes are read in a single scan. Neither the buzzer sounds nor the LED turns on until the specified no. of bar codes has been read.
Recommended method of use	This mode is suitable in the following cases: If the bar code has many digits. If the target bar codes are spaced. To positively confirm a read.	This mode is suitable in the following case: If multiple bar codes with small number of digits are adjacent to one another.

Note:
The terminal is designed so that a maximum of 10 bar codes or 4,095 digits of bar codes Can be read. However, it is not recommended for the user to use the package read mode for reading bar codes consisting of a large number of digits. If the number of bar codes is greater than 4, or if the total number of digits is greater than 100, use the multiple-step read mode as much as possible.

The functions of the Imager Library relevant to the Scanning Method are as follows.

IMGSetDecodeMode : Sets up scanning mode.

IMGGetDecodeMode : Retrieves the scanning mode.

IMGWaitForDecode : Carries out decoding symbol.

IMGWaitForDecodeRaw : Carries out decoding symbol including its binary data.

2.2.3 Scanning Parameters

Condition that allows scanning a symbology in specific modes can be set for each readable symbology.

Readable Symbology

Bar code symbologies that are enabled or disabled for scanning can be specified. If only specific symbologies are to be scanned, set "Enable" for scanning on these symbologies only and "Disable" on other symbologies. This reduces decode processing time and lowers error rate. The default is "Enable scanning on all the symbologies".

Readable Digits

The no. of readable digits can be set for each symbology. If only specific no. of digits is to be scanned, specify it for each readable symbology. This reduces decode processing time and lowers error rate.

Enable or Disable Check Digit

Check digit can be set to "Enable" or "Disable" for each readable symbology. Setting the check digit will lower error rate.

The functions of the Imager Library relevant to the Scanning Parameters are as follows.

IMGSetAztec	: Sets up decode options for Aztec symbology.
IMGGetAztec	: Retrieves the decode options for Aztec symbology.
IMGSetCodabar	: Sets up decode options for Codabar symbology.
IMGGetCodabar	: Retrieves the decode options for Codabar symbology.
IMGSetCodablock	: Sets up decode options for Codablock F symbology.
IMGGetCodablock	: Retrieves the decode options for Codablock F symbology.
IMGSetCode11	: Sets up decode options for Code11 symbology.
IMGGetCode11	: Retrieves the decode options for Code11 symbology.
IMGSetCode128	: Sets up decode options for Code128 symbology.
IMGGetCode128	: Retrieves the decode options for Code 128 symbology.
IMGSetCode32	: Sets up decode options for Code32 symbology.
IMGGetCode32	: Retrieves the decode options for Code32 symbology.
IMGSetCode39	: Sets up decode options for Code39 symbology.
IMGGetCode39	: Retrieves the decode options for Code39 symbology.
IMGSetCode49	: Sets up decode options for Code49 symbology.
IMGGetCode49	: Retrieves the decode options for Code49 symbology.
IMGSetCode93	: Sets up decode options for Code93 symbology.
IMGGetCode93	: Retrieves the decode options for Code93 symbology.
IMGSetComposite	: Sets up decode options for Composite symbology.
IMGGetComposite	: Retrieves the decode options for Composite symbology.
IMGSetDataMatrix	: Sets up option settings for DataMatrix symbology.
IMGGetDataMatrix	: Retrieves the decode options for DataMatrix symbology.
IMGSetEAN13	: Sets up decode options for EAN13 symbology.
IMGGetEAN13	: Retrieves the decode options for EAN13 symbology.

IMGSetEAN8	:	Sets up decode options for EAN8 symbology.
IMGGetEAN8	:	Retrieves the decode options for EAN8 symbology.
IMGSetHX	:	Sets up decode options for Chinese Sensible (HanXin) symbology.
IMGGetHX	:	Retrieves the decode options for Chinese Sensible (HanXin) symbology.
IMGSetIATA	:	Sets up decode options for IATA 2of5 symbology.
IMGGetIATA	:	Retrieves the decode options for IATA 2of5 symbology.
IMGSetITF	:	Sets up decode options for Interleaved 2of5 symbology.
IMGGetITF	:	Retrieves the decode options for Interleaved 2of5 symbology.
IMGSetISBT	:	Sets up decode options for ISBT symbology.
IMGGetISBT	:	Retrieves the decode options for ISBT symbology.
IMGSetMaxicode	:	Sets up decode options for Maxicode symbology.
IMGGetMaxicode	:	Retrieves the decode options for Maxicode symbology.
IMGSetMicroPDF	:	Sets up decode options for MicroPDF symbology.
IMGGetMicroPDF	:	Retrieves the decode options for MicroPDF symbology.
IMGSetMSI	:	Sets up decode options for MSI symbology.
IMGGetMSI	:	Retrieves the decode options for MSI symbology.
IMGSetPDF417	:	Sets up decode options for PDF417 symbology.
IMGGetPDF417	:	Retrieves the decode options for PDF417 symbology.
IMGSetQR	:	Sets up decode options for QR Code symbology.
IMGGetQR	:	Retrieves the decode options for QR Code symbology.
IMGSetRSS	:	Sets up decode options for RSS symbology.
IMGGetRSS	:	Retrieves the decode options for RSS symbology.
IMGSetTLC39	:	Sets up decode options for TLC39 symbology.
IMGGetTLC39	:	Retrieves the decode options for TLC39 symbology.
IMGSetUPCA	:	Sets up decode options for UPC-A symbology.
IMGGetUPCA	:	Retrieves the decode options for UPC-A symbology.
IMGSetUPCE	:	Sets up decode options for UPC-E symbology.
IMGGetUPCE	:	Retrieves the decode options for UPC-E symbology.

2.2.4 Scan Result Notification

The notification of the read completion of a symbol can be posted using one of the following two integrated devices. The buzzer sound level can be set up at the Control Panel.

Table 2.29

Device	Setting	Read succeeded	Read failed	Read terminated (release the Trigger key)	Default
LED	Green and Red	ON in green	ON in red	No	Green and Red
	Green	ON in green	No	No	
	Invalid	No	No	No	
Buzzer	Valid	Sound	No	No	Valid
	Invalid	No	No	No	
Vibrator	Valid	Vibrates	No	No	Valid
	Invalid	No	No	No	

The functions of the Imager Library relevant to the Scan Result Notification are as follows.

IMGSetLED   : Sets up notification with LED for scanning complete.
IMGGetLED   : Retrieves the notification with LED for scanning complete.
IMGSetBuzzer : Sets up notification with buzzer for scanning complete.
IMGGetBuzzer : Retrieves the notification with buzzer for scanning complete.
IMGGetVibrator : Sets up notification with vibrator for scanning complete.
IMGSetVibrator : Retrieves the notification with vibrator for scanning complete.

2.2.5 Expanded Features

Decode Customize Function

This function adjusts the scanning speed to facilitate scanning of hard-to-read symbols.

- **Decode Deliberation Levels**

The level of deliberation for scanning symbols can be set at five different levels. Setting the level to "Very Quick" or "Quick" limits symbols which can be decoded, but increases the decoding speed. Alternatively, setting the level to "Deliberate" or "Very Deliberate" allows many symbols to be scanned but slows down the decoding speed.

Table 2.30

Decode Deliberation Levels	Suitable Scan Mode/Bar Code Symbology	Decode Speed
Very Quick	− 1D bar code with good print quality	Very fast
Quick	− 1D bar code with poor print quality − PDF417 bar code with 500 digits or less	Fast
Normal	− Package mode − PDF417, MicroPDF, Code49, Codablock F, Composite Code, Aztec, QR Code, Maxicode, DataMatrix bar codes with 1,000 digits or less.	Normal (default)
Deliberate	− 1D bar codes with very poor print quality − PDF417 bar code with 1,000 to 2,000 digits. − TTLC39, GS1 DataBar Stacked, GS1 DataBar Expanded Stacked, Aztec, QR Code, DataMatrix bar codes with 80 digits or less.	Slow
Very Deliberate	− PDF417 bar code with 2,000 digits or more − TLC39, Aztec, QR Code bar codes with 80 digits or more	Very slow

The functions of the Imager Library relevant to the "Decode Deliberation Levels" are as follows.

IMGSetDeliberation   : Sets up deliberation level for decoding symbol.
IMGGetDeliberation   : Retrieves the deliberation level for decoding symbol.

- **Print Weight Adjust Function**

This function improves scanning bar codes comprised with thick or thin bars. The improvement can be selected in seven grades. In ordinary condition, the setting is not required to change. However, it is useful to change it if scanning a particular bar code is difficult.
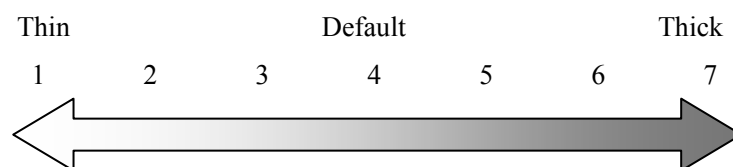
Figure 2-6

The functions of the Imager Library relevant to the Print Weight are as follows.

IMGSetPrintWeight : Sets up print weight of bar thickness used for decoding symbol.
IMGGetPrintWeight : Retrieves print weight of bar thickness used for decoding symbol.

- **Decode Window Function**

This is a function that specifies an area for decoding bar code located in the center of the aimer emitted by the CMOS Imager. It is useful for decoding a specific bar code symbol only among plural bar codes printed on same paper sheet. If either Mode 1 or Mode 2 of the parameters is specified in the **Decode Window** function, the decoding area is automatically determined to scan only a bar code located near the center. Setting the User Setting effect in the **Decode Window** function allows an area of decoding to be specified with X and Y coordinates.

Table 2.31

Setting Parameters for Decode Window function	Description	Remarks
Disable	Disable the Decode Window function.	
Mode 1	Scan a single bar code located in the center area of the aimer.	
Mode 2	Scan Composite code located in the center area of the aimer.	
User Setting	**Specify decode area with X and Y coordinates.**	

If the **Decode Window** function is set for scanning a bar code, a bar code or a part of the bar code that is within the aimer's area (see Figure 2.9) is scanned, and other bar codes outside of the area are not scanned. For example, in Figure 2.9, bar code A cannot be scanned because the entire bar code is outside of the aimer area, but bar code B can be scanned because a part of the bar code is within the area.
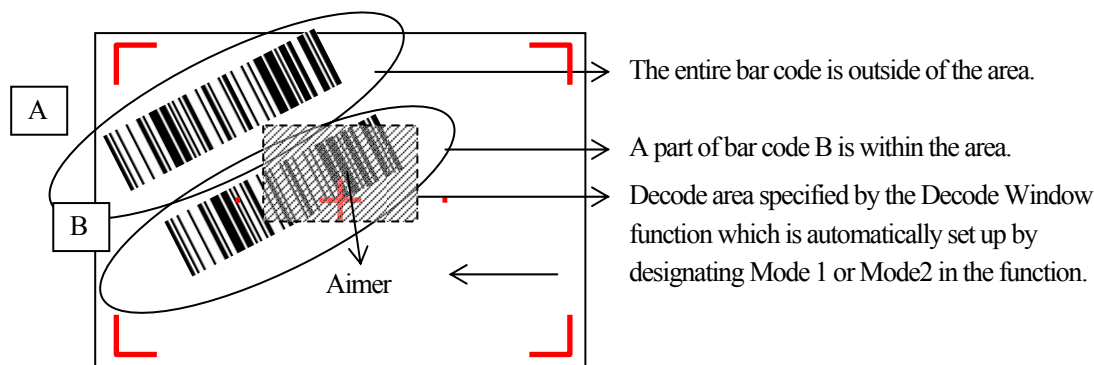
Figure 2-7

Note that the area of the aimer is a reference. It ca be varied by factors such as distance between the bar code and the terminal or angle of emitting the aimer.

The functions of the Imager Library relevant to the "Decode Window function" are as follows.

IMGSetDecodeWindow　: Sets up decode window area.
IMGGetDecodeWindow　: Retrieves decode window area.

- **Contrast-Reverse Symbols function**

This is function that scan special symbols which is printed out white color in black color background (Reverse printed Symbols).
When you specified Contrast-Reverse Symbols function, such kind of special symbol will be available to scan.

Table 2.32

Setting	Description	Remarks
Normal	Available to scan normal symbol (printed black color in white color background.)	Default
Contrast-Reverse	Available to scan Contrast-Reverse symbol (printed white color in black color background.)	
Both normal and Contrast-Reverse	Available to scan both normal and Contrast-Reverse symbol. But scanning performance will be decreased.	

This is function that scan special symbols which is printed out white color in black color background (Reverse printed Symbols).
Please take care when you set Contrast-Reverse mode, normal symbol will not be scanned.
About QR code, DataMatrix code and Aztec code is not related with this function setting. (These type of symbol are available to scan at both mode.)

The functions of the Imager Library relevant to the "Decode Reversed Symbol function" are as follows.

IMGSetDecodeReverse　: Sets up decode mode in reversed colors.
IMGGetDecodeReverse　: Retrieves the status of decode mode in reversed colors.

Automatic Linking of Combined Symbols

The CMOS Imager supports automatic linkage of multiple symbologies.
When scanning symbols with the following combined symbols (see Table 2.61), the scanned data is stored in the internal buffer and all of the data from combined symbols or all scanned symbols is combined and output.

Combined symbols can only be scanned when the decoding mode is set to "Ordinary Read" mode. Note that other modes including "Multi-step Read" and "Package Read" may cause incorrect result of scanning combined symbols.

Table 2.33

Symbology	Applicable Symbols	Combination Method
Code93	Code93 bar codes with a space at the forefront	1. When scanning symbols of Code93 symbology whose forefront begins with a space, the scanned data is stored in the internal buffer without being output. 2. Furthermore, when continuously scanning symbols starting with a space, the data is combined in the internal buffer in the order that it is scanned and is not output. 3. Finally, when scanning symbols other than those whose forefront begins with a space, it is combined with the internally stored data and output.
Code49	Code49 bar codes with mode 1 (M=1) at the forefront	Combination method is the same as for Code93 symbology. Different to Code93 is that the combined symbols start with M=1 at the forefront.
QR Code	QR Code with combination identifier.	Indicators displaying the number of symbol divisions and the sequential number of the symbol are stored in the combined QR Code. The decoder is therefore able to combine and output all data in the order of the indicators upon scanning all of the symbols.

Binary Data Scanning

The CMOS Imager is able to output data scanned from symbols not only in standard character strings but also in binary data. It is therefore possible to scan binary data of encoded data, images and audio as well as character strings delimited by NULL characters.

The function of the Imager Library relevant to the "Binary Data Scanning" is as follows.
IMGWaitForDecodeRaw : Carries out decoding symbol including its binary data.

Image Capture Function

This function is used to capture image data and save it as JPEG file. Using the function together with the JPEG Library, the captured image data is output as image data in either 2-gray scale or 256-gray scale. The captured image data can also be output in low resolution by reducing its size. The following table shows the reductions and sizes.

Table 2.34

Reduction		1/1, 1/2, 1/4
Size	1/1 reduction	752 x 480 pixels
	1/2 reduction	376 x 240 pixels
	1/4 reduction	188 x 120 pixels
	Partial extraction is possible.	
Scale		2- or 256-gray scale

The functions of the Imager Library and JPEG Library relevant to the "Image Capture Function" are as follows.

IMGGetImage : Captures still image.

JPGEncodeToFile : Encodes RGB data or YUV data to output the result as JPEG file.

JPGEncodeToFileEx : Encodes RGB data or YUV data to output the result as JPEG file. It specifies "with thumbnail" or "without thumbnail".

Signature Index Function

This function scans both symbol and signature at one time and outputs the symbol data and indexed signature at the same time. The position and size of a signature can be specified in the user application based on the position of the symbol.

The function automatically corrects the up and down positions of the captured symbol in correspondence with the up and down positions of the image data even if it has been captured upside down or diagonally, and then outputs it.
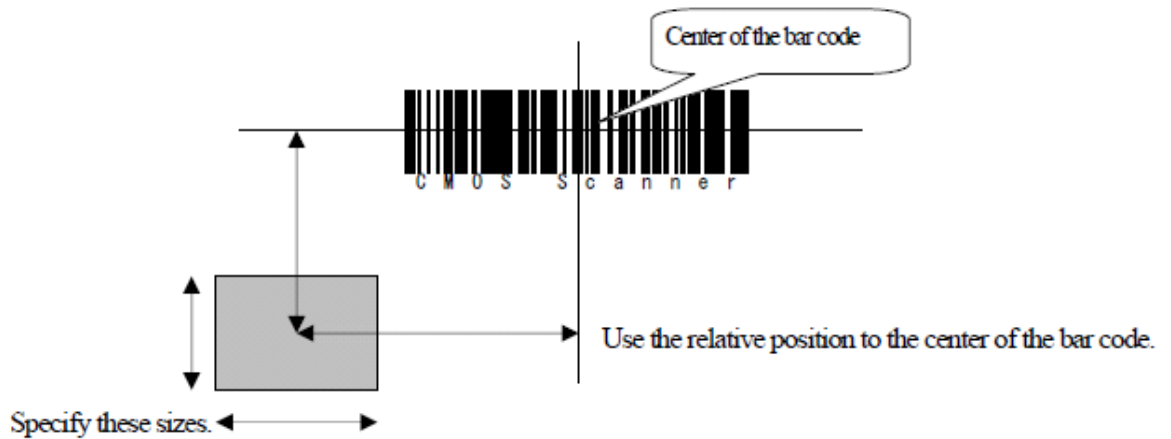
Figure 2-8

- Supported symbols
    - Code39
    - Codabar (NW7)
    - Code128
    - PDF417
    - Aztec

The functions of the Imager Library relevant to the "Signature Index Function" are as follows.

IMGCaptureSign : Retrieves captured signatures.
IMGWaitForDecode : Carries out decoding symbol.
IMGWaitForDecodeRaw : Carries out decoding symbol including its binary data.

Streaming Display Function

This function sequentially displays an image while continuously operating the CMOS Imager. With the image capturing function in "Image Capture Function", the streaming display function can be used to display image preview.

Table 2.35

Reduction		1/1, 1/2, 1/4
Size	1/1 reduction	188 x 120 pixels
	1/2 reduction	
	1/4 reduction	
	Partial extraction is possible.	
Scale		256-gray scale
Frame rate		15 fps or less (see note)

Note:
The rate may fluctuate depending on the surroundings brightness or the load on the system by concurrently running program.

The functions of the Imager Library relevant to the "Streaming Display Function" are as follows.

IMGStartStream   : Starts streaming images.
IMGGetStreamData   : Retrieves data of streaming images.
IMGStopStream   : Stops streaming images.

Illumination LED and Aimer

The terminal integrates the illumination LED for lighting and the Aimer for focusing a symbol to scan. Setting the intensity of the illumination LED to zero will turn off.
This setting is useful when the terminal is used outdoor where the illumination LED is not needed, or when a stamp in red is to be read.

The functions of the Imager Library relevant to the "Illumination LED and Aimer" are as follows.

IMGAimerOn   : Turns on or off the Aimer.
IMGIlluminationOn   : Turns on or off the illumination LED.

Imager's APO

This function will shut down the power to the CMOS Imager automatically if it has not been used for a while.

After activating the APO (Automatic Power OFF) function, the imager's power can be turned on again if one of the following functions is invoked. The time period of the APO function can be set up in the range of 0 to 1,800 seconds. Specifying "0" will disable it.

The power consumption by the imager can be curbed while the APO function is activating.

However, note that it takes about 30 milliseconds to put the power back on.

The functions of the Imager Library relevant to the Imager's APO are as follows.

IMGSetImagerAPO : Sets up time period for Auto Power OFF.
IMGGetImagerAPO : Retrieves time period for Auto Power Off.

2.2.6 Configuration File

The various settings made at "Imager Setting" of the Control Panel can be stored in an INI-type file and resumed. The configuration file storage location and its name are "\FlashDisk\System Settings\IMGSet.ini".

By calling **IMGLoadConfigFile** function, the content in the configuration file is deployed into the Imager, or the default values are used to initiate the Imager if there is no such the configuration file.

The functions of the Imager Library relevant to the Configuration File are as follows.

  IMGLoadConfigFile   : Sets up the Imager using configuration file.
  IMGSaveConfigFile   : Retrieves the Imager settings and saves into configuration file.

The setting in the configuration file is divided into two parts, the setting for scanning bar codes and the other for common operations. See the next three pages.

Setting for Scanning Bar Codes

For each symbology, parameters that can define the scanning performances are specified with its individual symbology name in the section name. See Table 2.64.

Table 2.36

Item	Description	Setting
[Symbology] Section		
Enable	Sets up "Enable" or "Disable" for scanning a symbology.	0; disable, 1; enable
Min	Specifies the minimum no. of digits for scanning a symbology.	
Max	Specifies the maximum no. of digits for scanning a symbology.	
Output Start/Stop Code	Sets up "Enable" or "Disable" for output of start and stop codes.	0; disable, 1; enable
Read On Check Char Read On Check Digit	Sets up "Enable" or "Disable" for scanning a symbology with check character.	0; disable, 1; enable
Output Check Char Output Check Digit	Sets up "Enable" or "Disable" for output of check character.	0; disable, 1; enable
Read On 2 Check Digit	Sets up "Enable" or "Disable" for scanning a symbology with 2-digit check character.	0; disable, 1; enable
Full ASCII	Sets up "Enable" or "Disable" for output of Full ASCII conversion.	0; disable, 1; enable
Only Carrier Message	Sets up "Enable" or "Disable" for output of carrier message only.	0; disable, 1; enable
Append 2Digit Addon	Sets up "Enable" or "Disable" for output of 2-digit addon data.	0; disable, 1; enable
Append 5Digit Addon	Sets up "Enable" or "Disable" for output of 5-digit addon data.	0; disable, 1; enable
Request Addon	Sets up "Enable" or "Disable" for scanning a symbology only with addon data.	0; disable, 1; enable
Separate Addon	Sets up "Enable" or "Disable" for output addon data separated with space.	0; disable, 1; enable
Output System Number	Sets up "Enable" or "Disable" for output of system number.	0; disable, 1; enable
Expand Version E	Sets up "Enable" or "Disable" for output of 12-digit expanded UPCA symbology.	0; disable, 1; enable

List of the Default Settings for Bar Code Symbologies

The below list shows the default settings and parameters for the 1D bar code symbologies.

Table 2.37

[Code39]	[Codabar(NW7)]	[EAN8]
Enable=0	Enable=0	Enable=0
Min=2	Min=2	Output Check Char=0
Max=48	Max=60	Request Addon=0
Output Start/Stop Code=0	Output Start/Stop Code=0	Separate Addon=0
Read On Check Char=0	Read On Check Char=0	Append 2Digit Addon=0
Output Check Char=0	Output Check Char=0	Append 5Digit Addon=0
Full ASCII=0		
Append=0		
[EAN13]	**[UPCA]**	**[UPCE]**
Enable=0	Enable=0	Enable=0
Output Check Char=0	Output Check Digit=0	Output Check Digit=0
Request Addon=0	Request Addon=0	Request Addon=0
Separate Addon=0	Separate Addon=0	Separate Addon=0
Append 2Digit Addon=0	Append 2Digit Addon=0	Append 2Digit Addon=0
Append 5Digit Addon=0	Append 5Digit Addon=0	Append 5Digit Addon=0
	Output System Number=1	Output System Number=0
		Expand Version E=0
[Interleaved 2of5]	**[Code93]**	**[Code128]**
Enable=0	Enable=0	Enable=0
Min=4	Min=0	Min=0
Max=80	Max=80	Max=80
Read On Check Digit=0		
Output Check Digit=0		
[MSI]	**[IATA]**	**[Code11]**
Enable=0	Enable=0	Enable=0
Min=4	Min=4	Min=4
Max=48	Max=80	Max=80
Output Check Char=0		Read On 2 Check Digit=1
[ISBT]	**[RSS]**	**[Code49]**
Enable=0	Enable=0	Enable=0
	Min=1	Min=1
	Max=80	Max=81
[PDF417]	**[MicroPDF]**	**[CodaBlock]**
Enable=0	Enable=0	Enable=0
Min=1	Min=1	Min=0
Max=2750	Max=2750	Max=2048
[Composite]	**[Maxicode]**	**[DataMatrix]**
Enable=0	Enable=0	Enable=0
Min=1	Min=1	Min=1
Max=2435	Max=150	Max=1500
UPCE EAN Composite	Only Carrier Message=0	
Enable=0		

Continue.

[QR Code] Enable=0 Min=1 Max=3500	[Aztec] Enable=0 Min=1 Max=3750	[TLCode39] Enable=0
[Code 32] Enable=0		

Setting for Common Operations

The settings in Table 2.66 are for the common operations not related to bar code symbology.

Table 2.38

Item	Description	Setting	Default
[PrintWeight] Section			
PrintWeight	Specify the calibration value for thickness of bars.	Specify in the range of 1 to 7.	4
[Intensity] Section			
Aimer	Specify the intensity of the Aimer.	Specify 0 or 100.	100
Illumination	Specify of the intensity of the Illumination LED.	Specify 0 or 100.	100
[Multi-step] Section			
ReadMode	Specify read mode.	0; Ordinary read 1; Multi-step read 2; Package read	0
ReadTimes	Specify the no. of times to scan in continuous mode.	Specify in the range of 2 to 10.	2
Separator	Specify the separator (= symbol) in Package read mode.	Specify character casted in INT-type.	0
[Scan Mode] Section			
Scan Mode	Specify scanning mode.	0; Outdoor 1; Indoor (by window) 2; Indoor 3; Warehouse	1
[Decode Deliberation] Section			
Decode Deliberation	Set the deliberation level.	100; Extremely fast decoding, but limited symbologies. 200; Fast decoding with some limited symbologies. 400; Normal 800; Slow decoding, but adequate number of symbologies covered. 0; Extremely slow decoding, but many symbologies covered	400
[Search Mode] Section			
Search Mode	Search mode	-	1

Continue.

[Auto Power OFF] Section			
Auto Power OFF	Imager's APO timer	Specify in the range of 0 to 1800 (in second), "0" disables APO, "1 to 1800" turns off the power to the Imager after the time period has elapsed.	0
[Indicator] Section			
LED	Specify turning on the LED when scanning is complete.	0; disable, 1; enable in green, 2; enable "success" in green and "failure" in red	2
Buzzer	Specify turning on the buzzer when scanning is complete.	0; disable, 1; enable	1
Vibrator	Specify turning on the vibrator when scanning is complete.	0; disable, 1; enable	1
[Decode Window] Section			
Enable	Specify decode window mode.	0; disable, 1; mode 1, 2; mode 2, 16; user define	0
Left	Specify left side coordinate of decode window.	Specify from 0 to 751	0
Top	Specify top side coordinate of decode window.	Specify from 0 to 479	0
Right	Specify right side coordinate of decode window.	Specify from 0 to 751	751
Bottom	Specify bottom side coordinate of decode window.	Specify from 0 to 479	479
[Decode Reverse] Section			
Enable	Specify decode reverse mode	0; No reverse 1; Reverse 2; Both	0

2.2.7 Concurrent Use with Other Device

Table 2.67 shows the concurrent use of decoder, streaming, capturing image of the CMOS Imager with other devices listed in the below table.

Table 2.39

Other Devices	Concurrent Use
Camera	Impossible.
USB	There may be a possibility, but it is not recommended to use the device concurrently.
Bluetooth	Possible.
WLAN	Possible.

2.2.8 Process of Image

Decoding and Encoding BITMAP/JPEG

The process of image performs encoding image data in BITMAP into JPEG file, and decoding image data in JPEG file into BITMAP.

Table 2.40

Process	Description		Remark
Encoding	Covert image data in RGB888 (24-bit color) into JPEG file.		
	Convert image data in YUV422 into JPEG file.		
Decoding	Convert image data in JPEG into RGB888 (24-bit color).		
	Convert image data in JPEG file into YUV422.		
Setting image quality and compress rate (when encoding)	0	High compress rate, low image quality	in the range of 0 to 100.
	100	Low compress rate, high image quality	

The functions of the JPEG Library relevant to the "Decoding and Encoding BITMAP/JPEG" are as follows.

JPGEncodeToFile   : Encodes RGB data or YUV data to output the result as a JPEG file.
JPGDecodeFromFile   : Decodes a JPEG file to output the result as BMP data.

Embedding Thumbnail into Image File

When saving an image file, the thumbnail can be embedded in the image file (applicable to only JPEG). Instead of displaying the whole image on the display screen, the thumbnail can be deployed on the screen to save time to load and decode the file.

The function of the JPEG Library relevant to the "Embedding Thumbnail into Image File" is as follows.

JPGEncodeToFileEx   : Encodes RGB data or YUV data to output the result as a JPEG file. It adds specified GPS positioning information and specifies "with thumbnail" or "without thumbnail".

2.3 Digital Camera

This chapter describes about detailed software specifications of the integrated digital camera (model dependant).

The camera driver integrated in the IT-9000 series handheld terminals is compatible with the Windows Driver Model (WDM) of Microsoft. Application program runs on the terminal can utilize the camera functions by controlling DirectShow API.

In this chapter, the properties of the DirectShow that can be set for the IT-9000 series handheld terminals are mainly explained. For detail of how to use the DirectShow, refer to the document available in Windows Mobile 6 SDK from Microsoft.

2.3.1 Basic Specifications

The terminal (model dependant) offers the following functions via the integrated digital camera module.

Table 2.41

Item	Setting Parameter					Remarks
Recorded image file format (Still image capture/consecutive shooting)	JPEG					- Available JPEG image quality
Size of captured still images	Mode	Portrait		Landscape		
		Width	Height	Width	Height	
	UXGA	1200	1600	1600	1200	
	Quad-VGA	960	1280	1280	960	
	XGA	768	1024	1024	768	
	SVGA	600	800	800	600	
	VGA	480	640	640	480	
	1/4VGA	240	320	320	240	
Finder (preview) display	Mode	Portrait		Landscape		
		Width	Height	Width	Height	
	4/9VGA	320	426	426	320	
	1/4VGA	240	320	320	240	
	1/9VGA	160	213	213	160	
	Frame rate 15.0 fps or more					- When circumferential luminance is 500 lx or more.
Zoom function	Digital Zoom (XGA capture mode: x1.5) (SVGA capture mode: x1.5, x2.0) (VGA capture mode: x1.5, x2.0) (1/4VGA capture mode: x1.5, x2.0)					
Sequential shooting function	Not supported.					
Shutter sound	Forcible shutter sound by audio					
Recorded video file format	WMV					
Size of captured video clips	Mode	Portrait		Landscape		
		Width	Height	Width	Height	
	1/4VGA	240	320	320	240	

Note:

The orientation (Portrait or Landscape) in Table 2.69 is dependant on the screen orientation of the terminal. See "Screen" settings.

Preview Display

This is for displaying an image in real time being captured by the camera. The following are image sizes and frame rates for preview display.

Table 2.42

Item	Parameter				
Screen size in preview display	Mode	Portrait		Landscape	
		Width	Height	Width	Width
	4/9VGA	320	426	426	320
	1/4VGA	240	320	320	240
	1/9VGA	160	213	213	160
	Each image size above can be magnified by "x1.0", "x1.5", or "x2.0".				
Frame rate	15 or more frames per second				

The functions of the Camera Library relevant to the "Preview Display" are as follows.

CAMStartPreview : Start preview.
CAMStopPreview : Stop preview.

2.3.2 Capturing Images

Capture Static Image and Save in File

This function captures single static image and then outputs it in JPEG format file.

Table 2.43

Item	Setting Parameter				
Image size to capture	Mode	Portrait		Landscape	
		Width	Height	Width	Width
	UXGA	1200	1600	1600	1200
	Quad-VGA	960	1280	1280	960
	XGA	768	1024	1024	768
	SVGA	600	800	800	600
	VGA	480	640	640	480
	1/4VGA	240	320	320	240
File format	JPEG file				

After calling the static image capture function, there is a time-lag of approximately 400 milliseconds until when an image is actually captured. The camera driver notifies the operator of the terminal that the image has been captured with the shutter sound. Focus adjustment can be performed using the Auto Focus function and the fixed-focus switch (10 levels), thereby enabling the operator to capture a focused image.

Notes:
- Prior to capturing static images, secure the sufficient memory size (recommended 2Mbytes or more) remained in storage where the captured static images are stored.
- When temperature of the LED becomes high, for safety, capturing images with flash function by using the LED and the functions that controls ON/OFF of LED illumination will not be operable.

JPEG File Option

For the use of JEPG as output file, the options listed in the table can be set.

Table 2.44

Parameter	Setting	Remarks
Quality (Compression rate)	Quality = low (Compression rate = high)	
	Quality = middle (Compression rate = middle)	Default
	Quality = high (Compression rate = low)	
	Quality = highest (Compression rate = lowest)	
Baseline progressive	Baseline	This is a file format which displays image from upper line (Default).
	Progressive output function is not supported.	
Thumbnail function	Not supported.	

The functions of the Camera Library relevant to the "JPEG File Option" are as follows.

CAMGetImageSettings : Retrieve the options of JPEG file.

CAMSetImageSettings : Set up the options of JPEG file.

Movie Capture Function

This is a function for capturing movie and to output the data in movie file.

Table 2.45

Parameter	Setting				
Image size to capture	Mode	Portrait		Landscape	
		Width	Height	Width	Width
	1/4VGA	240	320	320	240
Video codec	Microsoft Windows Media Video				
File extension	wmv				
Bit rate setting	VBR (Variable bit rate)				
Audio codec	PCM				
Frame rate	6fps to 15fps				

Digital Zoom

The digital zoom is a function used to cut out a part of image from the high-resolution image. The following image sizes and magnifications can be used for digital zoom shooting.

Table 2.46   Digital Zoom

Magnification	1/4VGA	VGA	SVGA	XGA	Quad-VGA	UXGA
x 1.5	Yes	Yes	Yes	Yes	No	No
x 2.0	Yes	Yes	Yes	No	No	No

Note:

If shooting is performed in one of the modes marked as "No" in the table, shooting is made without digital zoom ("x 1.0") effect.

The functions of the Camera Library relevant to the "Digital Zoom" are as follows.

CAMGetDigitalZoom   : Retrieve current digital zoom setting.
CAMSetDigitalZoom   : Set up digital zoom setting.

Light Mode Function

The light mode is to allow an image to be captured under a natural brightness according to the light source in the surrounding area. The following 5 modes can be selected for the light mode.

Table 2.47   Light mode

Auto
Shooting in outdoor in cloudy sky (color temperature = 6500K)
Shooting under fluorescent lamp (color temperature = 5000K)
Shooting under incandescent lamp (color temperature = 2850K)
Shooting under dark place (white balance = auto, shutter speed = slow)

Note:

If a desired image is not captured in the "Auto" mode, specify other light mode according to light source in the surrounding area. Even if such the optimum light mode is set, other light sources reflected by wall, etc., may affect the color temperature causing the image to be displayed in incorrect color tone.

The functions of the Camera Library relevant to the "Light Mode" are as follows.

CAMGetLightMode   : Retrieve the current light mode setting.
CAMSetLightMode   : Set up light mode option.

Brightness Correction

This is for correcting the brightness. "Brightness" referred to in this explanation is the target value for automatic exposure. Exposure is determined automatically in accordance with the brightness of image to capture, but a target value if you wish to set can be set in the range of 0 (dark) to 24 (bright). The default is 12.

The functions of the Camera Library relevant to the "Brightness Correction" are as follows.

CAMGetSensitivity : Retrieve the current brightness setting.
CAMSetSensitivity : Set up brightness setting.

Illumination LED

Illumination LED On/Off and its brightness can be set.
Illumination LED should be used to capture image (in close distance only) in dark place using the digital camera.
Intensity of the Illumination LED can be set in the range of 0 (dark) to 100% (bright). The default is 80%.

The functions of the Camera Library relevant to the "Illumination LED" are as follows.

CAMIlluminationOn : Turn on and off the Illumination LED.
CAMGetIllumination : Retrieve the current illumination LED's brightness setting.
CAMSetIllumination : Set up Illumination LED's brightness.

Flash LED

The Flash LED can be used to capture still images. The Flash LED has two modes, prohibited to flash and forcible to flash (default). The brightness of the Flash LED can be set in the range of 0 to 100%.

Table 2.48

Parameter	Setting
Flashing the LED	Prohibited to flash (default), Forcible to flash
Intensity switch over	0% (dark) to 100% (brightness), default is 80%

The functions of the Camera Library relevant to the "Flash LED" are as follows.

CAMGetFlash : Retrieve the current Flash LED setting.
CAMSetFlash : Turn on and off the Flash LED.
CAMGetIllumination : Retrieve the current brightness of the Illumination LED.
CAMSetIllumination : Set up brightness of the Illumination LED.

Compulsory Shutter Sound

The shutter sound is generated by the audio during shooting photos. To prevent video voyeurism, whatever the case, it is forced to sound including when the audio is set to mute and when a set of earphones is being used.

Flickerless

The CMOS Camera in built-in IT-9000 detects flicker automatically and minimizes the affection by it.

Focus Adjustment

The CMOS digital camera is equipped with a focus adjustment function to enable the operator to capture focused images. This adjustment comes in the form of a fixed-focus switch and an autofocus feature. The fixed-focus switch enables the application program to switch the focus to suit the distance to the object being captured.

The autofocus feature automatically adjusts the focus to suit the distance of the object being captured. Executing the autofocus function in preview mode automatically adjusts the lens position to focus the camera. The autofocus adjusts the preview screen s fixed area (focus area) so that it comes into focus. When the focus area and the focus frame display functions are enabled, a frame known as the focus frame appears on the preview screen. The focus frame appears green when the autofocus has been successful. When the autofocus function is not selected or when it is unsuccessful, the focus frame turns to red. When capturing a still image upon successful autofocus, the focus frame returns to red.

Table 2.49

Parameter	Setting
Fixed-focus switch	Range of 1 (close range) to 10 (long range)
Autofocus	No setting required
Focus frame display	Disabled (default) or Enabled

The functions of the Camera Library relevant to the "Focus Adjustment" are as follows.

CAMGetFocus	: Retrieves the position set with **CAMSetFocus** function.
CAMSetFocus	: Sets up the focus position.
CAMGetFocusStatus	: Retrieves the current focus position.
CAMAutoFocus	: Adjusts focus in automatic focus

Flipping Image

In the IT-9000, the direction of flipping image on the screen is determined in accordance with OS's screen flip setting. For the specifications of flipping screen image, refer to "Camera Rotation" in MSDN library.

Table 2.50

Item	Image	Setting
Flipping image	Preview display	– (Flip image in clockwise) – No flip (default) – 90 degree (OS. When specifying image to flip 90 degree in clockwise.) – 270 degree (OS. When specifying image to flip 90 degree in counterclockwise.)
	Captured image	– (Flip image in clockwise) – No flip (default) – 90 degree (OS When specifying image to flip 90 degree in clockwise.) – 270 degree (OS When specifying image to flip 90 degree in counterclockwise.)

Adjusting Frame Rate

Frame rate which is output to preview display by the integrated camera module is adjusted automatically in accordance with the surrounding brightness, not exceeding the maximum frame rate. The camera module has the capability of setting the maximum frame rate. It is to set the maximum frame rate in 4 grades output by the camera module in preview display. In capturing movie, the maximum frame rate requires the software resource used for encoding. The more you set higher frame rate, the more it takes time to encode and the program memory is needed.

Table 2.51

Parameter	Setting	Remarks
Maximum frame setting	Max. frame rate = low	– When capturing movie – Encode time = short – Program memory required = small
	Max. frame rate = ordinary	– When capturing movie – Encode time = middle – Program memory required = ordinary
	Max. frame rate = high	– When capturing movie – Encode time = long – Program memory required = large
	Max. frame rate = highest	– Not allowed to set for capturing movie.

Adjusting Movie File

The integrated camera module has the capability of setting movie quality (delicacy, smoothness, beauty of the movie screen when playing back movie) and recording sound in capturing movie. If you set the screen quality higher, captured movie can be in a good quality, but it makes the file size be swelled. It can also set sound in recording movie. If you play with some of the buttons while you are capturing movie, it may record sound. Before starting movie, be sure to secure sufficient free memory for both storage and program (10MB or more for storage memory or 35MB or more for program memory with the assumption that high screen quality, frame rate at high, with recording sound and time period of 30 second to capture movie are set.)

Table 2.52

Item	Setting	Remarks
Screen quality(Compression rate)	Quality = low (Compression rate = high)	
	Quality = middle (Compression rate = middle)	Default
	Quality = high (Compression rate = low)	
	Quality = highest (Compression rate = lowest)	
Movie file format	WMV	Encoder : Windows Media Video 9 FourCC: WMV3 (Default)
With sound or without	With sound	
	Without sound	Default

Control on Power/CPU Clock

While the camera is in operation (preview display, capturing images, capturing movie), set the CPU clock to its highest for the speed of capturing movie until preview display ends.
To save power consumption, always turn off the power to the camera module and ASIC for the camera module while the camera is not in operation. Turn on the power only when the camera is in operation and turn off it again as soon as the use of the camera is ended.

Control on Exclusive Operations

The operations in the table are exclusive processes with the camera. The integrated CMOS Imager (model dependant) is controlled to avoid the concurrent use with the camera. This is that both devices use the same hardware resource in the terminal. If both devices are operated at same time, either one of the devices initiated first has the priority over the other. For example, if you attempt to operate "preview display" while the CMOS Imager is being opened, the camera driver returns an error.

Table 2.53

Device	Excluded Operations
Camera	Preview display, capturing still image, capturing movie.
CMOS Imager	Opening CMOS Imager.

2.4　Near Field Communication (NFC)

2.4.1　Basic Specifications

The following types of smart card can be accessed for reading and writing by the Near Field Communication (hereafter referred to it as NFC) integrated in the terminal.

- ISO/IEC14443 Type A (MIFARE Standard; Ultralight) See note 1.
- ISO/IEC14443 Type B
- FeliCa;FeliCa Lite　See note 2.
- ISO15693(Tag-It HF-I Plus, ICODE SLI, ICODE SLI-L, ICODE SLI-S, my-d V 10 Plain, my-d Light, Tag-it HF-I Plus, Tag-it HF-I Pro, Tag-it HF-I Standard) See note 3.

Notes
- Memory configuration and command specifications of each card are different. Refer to specifications of the respective cards.

Notes
1. The NFC does not support MIFARE DESFire, ProX, SmartX, and Plus cards. The security feature specifically implemented in these cards is not supported by the NFC.
2. The FeliCa security area can be accessed by using a FeliCa SAM card "RC-S251". RC-S251 can be accessed from the SAM library or the NFCFelica library.
3. About Tag-it series, Lock AFI / LockDSFID command is not supported by NFC controller specification. And when you use Write Single Block / Lock Block / Write AFI / Write DSFID command, you need to execute re-try operation of command in user application.

2.4.2 Communication Functions

Reading and writing data with a smart card is performed by the way of contactless communication between the integrated NFC module in the terminal and that smart card. Smart card is preprogrammed by the manufacturer to perform certain operations in response to prescribed commands. When a command is correctly transmitted by the terminal via the NFC to smart card, the smart card responds to the received command by performing a corresponding operation. Once the operation is complete, the smart card then transmits response indicating the result of the operation.

An explanation of the functions relating to this communication process is provided below.

Card Polling Function

This function carries out the following performances.

- Searches smart cards within the communication range
- Detects smart card
- Activates smart card
- Retrieves smart card response information

The card polling function terminates searching smart cards either when it detects a smart card, the preset timeout elapses, the assigned callback function returns 'FALSE', or the 'stop polling' function is carried out.

Once the smart card has been successfully activated, the NFC module continually transmits radio waves in order to supply power to the smart card. This radio wave transmission terminates automatically when the 'radio off' function is carried out or when a certain preset time elapses without any communication between the NFC module and the smart card. It is possible to enable or disable the automatic stop (auto stop) setting and to change the time until the auto stop occurs (i.e. the timeout). Under the default settings, the auto stop is set effect and the timeout is set to 1,000 milliseconds.

About IC card search method

There are following search methods.

Search method	Detail	Usage
Normal mode	One piece IC card will be started. Search operation will be terminated by the following condition. . Find one IC card . Passed timeout period . Specified call back function return FALSE . Execute polling stop function	This is simple method for communicate with one IC card, normally this method should be used.

Multi Step mode	While specified call back function return TRUE, start IC card continuously. There is no case to start again IC card which started before. Control will be returned to application at each IC card start timing. Application will start IC card as maximum 100 pieces according to execute this function continuously. Search operation will be terminated by the following condition. . Find one IC card . Passed timeout period . Specified call back function return FALSE . Execute polling stop function Started card's Uid will be recorded in driver history at each IC card started. Double starting will be prevent by compared this history and started IC card. This history record will be clear by started specified IC card, passed timeout period, call back function return FALSE, execute polling stop function.	If you do not scan again before scanned and want to scan IC card continuously like Goods stock taking, in such case Multi Step mode should be used.
Multi Step 2 mode	Basically execute same as Multi Step operation, but operation which found IC card started before will be different. Case of Multi Step operation, when IC card started before is found, search operation will be continued without notify upper application, Case of Multi step 2 operation, when IC card started before is found, search operation will be continued with notify upper application.	Should be used same as Multi Step operation
Package mode	This is package function which start same type several IC cards at the same time. 4 pieces IC cards as maximum can be started as package mode. Search operation will be terminated by the following condition. (*1, *2, *4) . Find specified number IC card . Passed timeout period . Specified call back function return FALSE . Execute polling stop function	Should be used package mode for scan specified several IC cards at the same time.

- *1 Type B is not supported in Package mode.
- *2 Cards which can scan at the same time in package mode is same card type only. Therefore it is impossible to scan different type cards at the same time. Ex. TypeA and Felica card can not scan at the same time.
- *3 When you want to start Multi Step operation to Mifare Standard 4 Byte UID type card and if there is same UID card in some target cards inside, first card is OK for scanning but second card can not scan.
*4 About maximum number of package mode, Type A is 4 pieces, FeliCa and ISO15693 is 2 pieces.

Power saving control at card polling

It is possible to save power consumption by search IC card with adjust to long as radio wave sending period.
But sending period will be longer than before, then IC card detect response will be down.
Please try to use this method for long time continuously IC card waiting case.

Data Communication Functions

Data communication becomes possible once the smart card has been activated by the card polling function. Communication ends once the NFC module has received the response information from the smart card in response to a transmitted command or when the timeout elapses.
When the communication is successful, the smart card remains in the activated mode, thus enabling consecutive transmission of other data.

Table 2.54

Function	Description	Termination Criteria	Timeout
Card polling	Searches smart cards within communication range and, upon detection, activates smart card and retrieves its response information.	– Smart card is successfully activated and card information is retrieved. – Timeout elapses. – Assigned callback function returns 'FALSE'. – 'Stop polling' function is carried out.	In the range of 100 to 60,000 milliseconds or no timeout.
Data communication	Data communication can be performed with successfully activated smart card.	– Smart card response information has been received. – Timeout elapses.	60 milliseconds (see note)

Note:
A timeout occurs if the wait time, starting when the NFC module transmits a command to smart card until when the NFC receives a response from the smart card, elapses 60 milliseconds.

Below is an example of data communication between the NFC module and smart card.
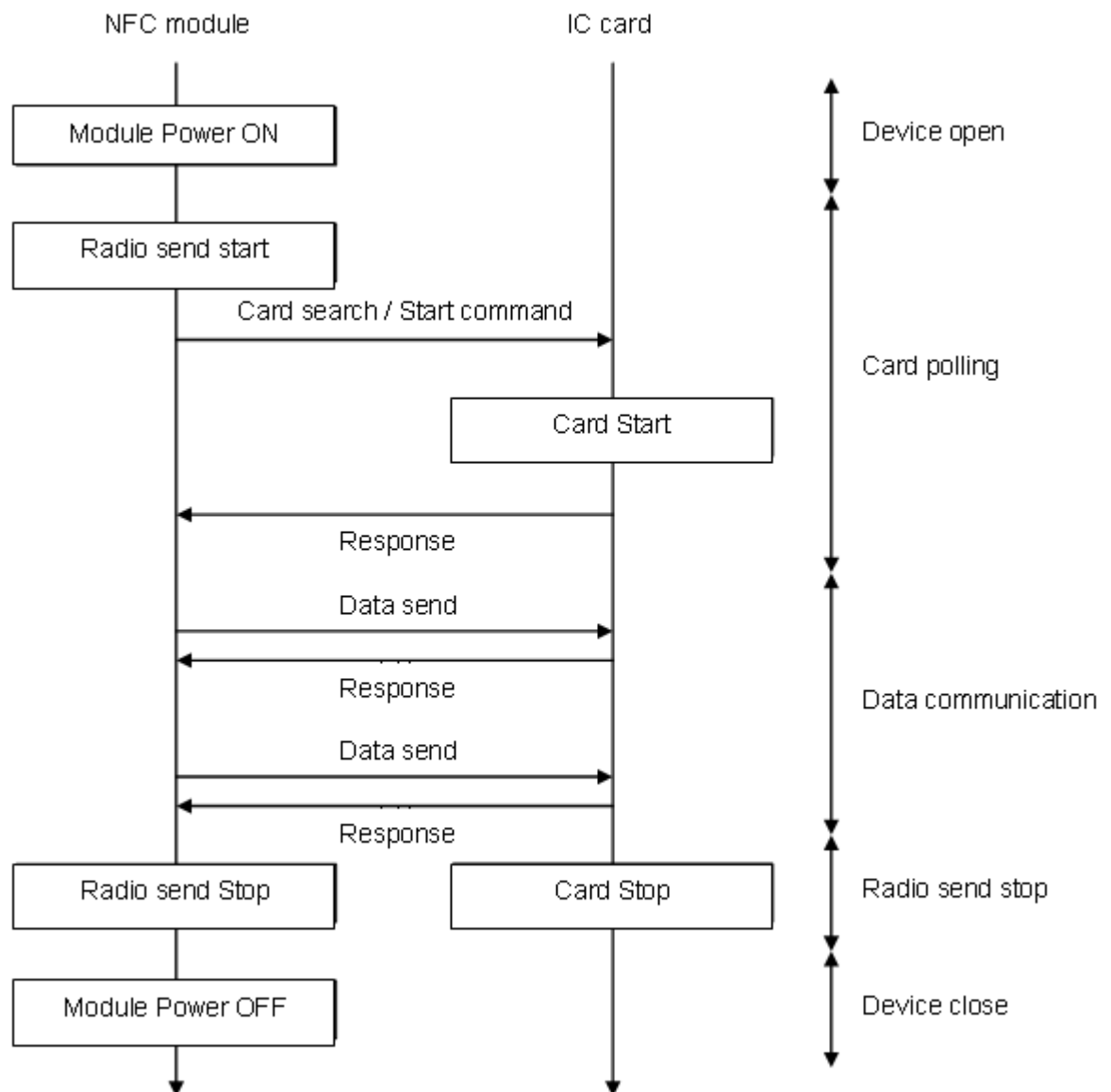
Figure 2-9

Note:
The NFC module consumes very little power while it is turned on. In addition, turning on the module takes time so if you would like to start communicating with a smart card very quickly, turn on the module at same time when activating the application. To start communication with a smart card, start it by performing card polling. After the application is complete, be sure to close the NFC module.

2.4.3 Expanded Features

Radio Wave Auto Stop Timing Notification

After successfully activating a smart card with the card polling function, the radio wave transmission will stop automatically if a certain time period elapses without any data communication between the NFC module and the smart card. If this happens, it is possible to send a notification, via either a window message or an event, of the timing when the radio wave transmission stopped. This notification function can be set effect or disabled, and is set disabled by default.

2.4.4 Power Control

Power-off When Not in Use

In order to save power, no power is supplied to the NFC module and the ASIC for controlling the NFC module when the devices are not open. The devices are turned on with the respective open functions and turned off with the respective close functions.

Control on Power When Terminal is Off

The NFC control software switches on/off of the module when the terminal is turned off. Furthermore, when the terminal power is switched on again, the NFC control software carries out relevant process corresponding to what the module was in when the terminal was turned off. The respective operations which occur when the terminal power is turned on or off are shown in the table below.

Table 2.55

Mode	Terminal power OFF	Terminal power ON
Card polling in process	– Card polling suspended – Power off on module	– Power on on module – Card polling resumes (note 1)
Data communication in process	– Data communication suspended – Power off on module	– Power on on module (note 2)
Open mode	– Power off on module	– Power on on module
Closed mode	– No processing	– No processing

Notes:
1. When card polling resumes after the power is turned back on, the timeout restarts from where it ended in the card polling before the power on the terminal is turned off. In addition, counting time on card polling is suspended while the terminal power is off.
2. In case the module power is turned off during data communication with smart card and operation is suspended, the power supply to the smart card is also interrupted so the mode on the card is reset. Carry out card polling to restart communication.

2.5 Secure Application Module (SAM)

This chapter describes about detailed specifications of the SAM.

2.5.1 Basic Specifications

Access functions are supported for SAM cards inserted in the SAM card slot. Communication can be performed with SAM cards compliant with ISO7816.

2.5.2 Power Control

SAM card controller power control

When a SAM device is opened, power is supplied to the SAM card controller and the ASIC that controls the controller. When a SAM device is closed, power to the SAM card controller and the ASIC that controls the controller is cut off.

The following SAM library functions relate to this function.

SAMOpen	: Turns on power to the SAM card controller
SAMClose	: Turns off power to the SAM card controller

SAM card power control

The power supply for the SAM card can be controlled to switch on and off by executing a SAM library function while a SAM device is open. Up to three card slots are equipped (*1) and the power supply to each card slot can be controlled to switch on and off.

*1 The number of card slots varies between models.

The following SAM library functions relate to this function.

SAMPowerUpCard	: Turns on power to the SAM card in the specified slot
SAMPowerDownCard	: Turns off power to the SAM card in the specified slot

2.5.3 Communication Functions

Command Send/Receive Functions

APDU (Application Protocol Data Unit *1) format commands can be sent to a SAM card that is switched on. Information from the SAM card in response to such commands can be acquired.

*1 Refer to the ISO7816-3 standard for details of the APDU format.

The following SAM library functions relate to this function.

SAMExchangeData	: Sends APDU-format commands to the SAM card in the specified slot, and receives responses

The following is an example of command send/receive operations between the application and the SAM card.

```
┌─────────────┐      ┌─────────────┐      ┌─────────────┐
│ Application │      │ SAM library │      │  SAM card   │
└─────────────┘      └─────────────┘      └─────────────┘
```

SAMOpen →

SAM card controller power on

SAMOpen return ←

SAMPowerUpCard →
Power on →

SAM card power on

Response data ←
SAMPowerUpCard return ←

SAMExchangeData →
Send APDU command →

Process APDU command

Receive APDU response ←
SAMExchangeData return ←

SAMPowerDownCard →
Power off →

SAM card power off

SAMPowerDownCard return ←

SAMClose →

SAM card controller power off

SAMClose return ←

Communication with multiple slots

Power on control and commands to SAM cards in other slots can be sent and received while power to the SAM card in any other slot is maintained. In case of switching access between SAM cards in the slots, the accessed slot is switched without cutting off the power to the slot that was accessed immediately before, so that switching access back to the previous slot is immediate.

2.5.4 Processing During Suspend and Resume

The SAM control software switches the SAM card controller and the SAM card off when the handheld terminal is turned off. The actions stated in the table are performed when the terminal resumes.

Table 2-5-3

Mode	When terminal is suspended	When terminal resumes
Open mode	SAM card controller power off SAM card power off	SAM card controller power on SAM card power off
Card power is on	SAM card controller power off SAM card power off	SAM card controller power on SAM card power on (*1)
Closed mode	No process	No process

*1 When the terminal is suspended by auto power off etc., the content set on the SAM card is initialized. To restore previous status, it is necessary to make the previous settings again after resuming.

2.6 USB

This chapter describes about detailed specifications of the USB.

2.6.1 Basic Specifications

Switching USB

- Switching between USB Client and USB Host is carried out by following electric signals.
  - Signal occurred by the USB cable (for USB Client/Host)
  - Signal occurred by the cradle

  This cannot be performed in application.
- Don't switch during USB communicating and while USB device is connected and the terminal is recognizing the USB device.
- It is possible to check the current status of USB Client/Host by **USB Connection** applet.
- You can select preferential connection (USB cable or cradle) by **USB Connection** applet. Preferential connection works when USB cable is connected to the terminal and terminal is on the cradle. (See 3.26 USB Connection for its detail.)
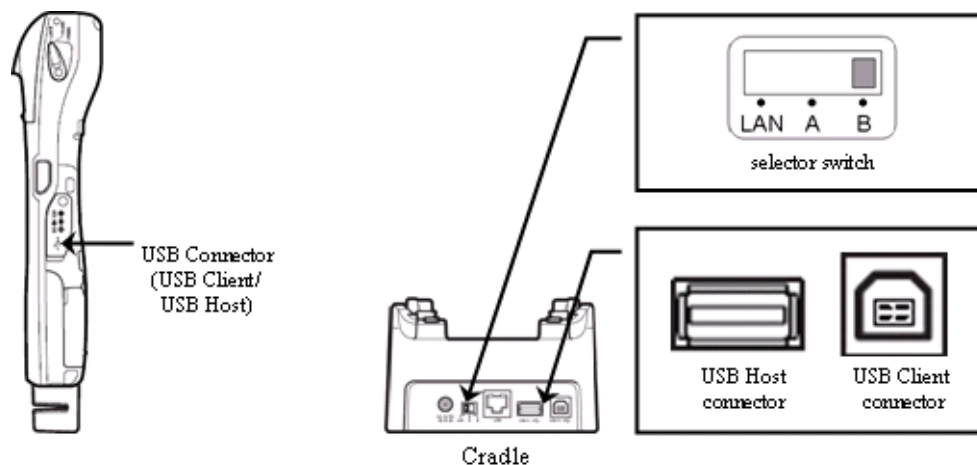
Figure 2.10

Table 2.56 In case connection by USB cable is set as preferential USB connection

Terminal / Cradle	Any USB device is not connected	USB device is connected to USB Client connector	USB device is connected to USB Host connector
Any USB device is not connected	No USB connection	Connection by USB cable (USB Client) is effective	Connection by USB cable (USB Host) is effective
USB device is connected to USB Client connector and selector switch is set to "B" position	Connection by cradle (USB Client) is effective	Connection by USB cable (USB Client) is effective	Connection by USB cable (USB Host) is effective
USB device is connected to USB Host connector and selector switch is set to "A" position	Connection by cradle (USB Host) is effective	Connection by USB cable (USB Client) is effective	Connection by USB cable (USB Host) is effective

Notes:

- If USB cable is connected to the terminal when connection by cradle has been established, connection by cradle will be disconnected and connection by USB cable will be established.

Table 2.57 In case connection by cradle is set as preferential USB connection

Terminal / Cradle	Any USB device is not connected	USB device is connected to USB Client connector	USB device is connected to USB Host connector
Any USB device is not connected	No USB connection	Connection by USB cable (USB Client) is effective	Connection by USB cable (USB Host) is effective
USB device is connected to USB Client connector and selector switch is set to "B" position	Connection by cradle (USB Client) is effective	Connection by cradle (USB Client) is effective	Connection by cradle (USB Client) is effective
USB device is connected to USB Host connector and selector switch is set to "A" position	Connection by cradle (USB Host) is effective	Connection by cradle (USB Host) is effective	Connection by cradle (USB Host) is effective

Notes:
- If terminal is put on the cradle when connection by USB cable has been established, connection by USB cable will be disconnected and connection by cradle will be established.

USB Client (USB Function)

- Supports the USB 1.1 full speed.
- Communication with PC can be established via ActiveSync/Windows Mobile Device Center.
- Communication with PC can be established via FLCE/LMWIN (this case, ActiveSync/Windows Mobile Device Center must be disabled.)

USB Host

- Supports the USB 1.1 full speed.
- Supports USB-MODEM, USB-LAN, and USB-Storage.
- USB device is disconnected when the terminal is suspended.
- Does not support WakeOn Ring and WakeOn LAN.
- Does not support communication via USB HUB.

USB-MODEM

- Supports the USB Communication Class (CDC: ACM).
- Communication with modem via virtual COM port can be established.
- Dial up via USB modem can be possible by selecting USB modem at the setting of connection under Windows Mobile.

USB-LAN

- Supports the Ethernet Cradle.
- Can be connected to network via the TCP/IP protocol using the TCP/IP Wrapper Driver.

USB-Storage

- Supports USB-Storage.

2.6.2 COM Port

COM ports used with the USB are as follows.

Table 2.58

USB Function	COM2
USB-MODEM	COM5

2.6.3 Product ID

USB product ID is as follows.

Table 2.59

USB Product ID	0x00CE

2.6.4 Vendor ID

USB vendor ID is as follows.

Table 2.60

USB Vendor ID	0x045E

2.7 Bluetooth

This chapter describes about detailed specifications of the Bluetooth.

2.7.1 Basic Specifications

Version

Bluetooth$^®$ Version 2.0 + EDR

Master

The master establishes a connection with Bluetooth equipment in slave mode waiting for connection with the master.

Client (Slave)

The client (slave) becomes in waiting mode for communication initiated by the master.

Security/Encryption

This performs security (PassKey exchange) and encryption as laid down in the Bluetooth standard.

AFH

This automatically limits and controls radio wave frequency band to be employed in Bluetooth communication.

Fast Connection

This is to convert radio frequency for Bluetooth communication into transmission pattern which allows connection establishment quickly.

EDR (Enhanced Date Rate)

If the communication partner supports also EDR, the EDR is set as radio wave type automatically by negotiation with the partner device. There is no setting required for the EDR mode. Communication seed via the EDR between the two terminals is approximately 500 Kbps maximum.

2.7.2　Communication Profiles

The Bluetooth profiles described in the table are supported.

Table 2.61

Function	Purpose
GAP (General Accessible Profile)	Used in the substructure segment of Bluetooth communications such as device discovery, link establishment and security.
SDP (Service Discovery Profile)	Used to search for currently usable services provided by the partner Bluetooth equipment.
Serial Profile (Client)	In Bluetooth serial communication, this is used for connection to other Bluetooth equipment.
Serial Profile (Server)	In Bluetooth serial communication, this is used for acceptance of connection request from other Bluetooth equipment.
DUN (Dial-Up Network)	This is used in dial up communication via Bluetooth mobile phone. (Windows Mobile Classic Only)
OBEX Object Push Profile	This is used as easy file send and receive.
HeadSet Profile	This is used in telephone (voice communication.) via Bluetooth Headset. (Windows Mobile Professional Only)

Bluetooth communication applications and communication methods as well as profile relationships are as follows.

Table 2.62

Partner Bluetooth Equipment	Communication Application	Profile
Bluetooth mobile phone, Bluetooth modem, etc.	Dial up	DUN
Bluetooth printer	Printing to printer	Serial Profile
PC for Bluetooth + ActiveSync	Connection with host PC	Serial Profile

2.7.3 Security

This feature supports security functions laid down in the Bluetooth standard. The Bluetooth security is divided into authentication and encryption.

These are realized by the use of PassKey (otherwise known as PIN code). PassKey is a shared (common) authentication key used when forming a connection and trust relationship (bonding) with Bluetooth equipment. A maximum of 16 characters (in ASCII code) can be used, but there may be limitations on the no. of digits and usable characters due to the specifications of partner Bluetooth equipment. Also PassKey input must be done within 30 seconds from a time when PassKey input request is generated. Note that PassKey input is not required once "device trust" has been established with Bluetooth equipment in previous connection. However, the partner Bluetooth equipment must have also the trust relationship in memory.

Encryption is carried out using a link key generated after PassKey exchange and a cipher key generated from a 128-bit random number. Here, the partner Bluetooth equipment also must support the encryption. PassKey exchange is required for Bluetooth connection when encryption is set enabled.

2.7.4 COM Port

The following is the COM ports used with the Bluetooth.

Table 2.63

Serial Profile (Client)	COM6 / COM7
Serial Profile (Server)	

Case of using CASIO Bluetooth library
Table 2.64

Serial Profile (Client)	COM6
Serial Profile (Server)	COM7

Simultaneous Use of Multiple Bluetooth COM Ports

Multiple Bluetooth COM ports by Serial profile can be opened simultaneously to use.
At this time, you should specify COM port at each Bluetooth devices.

About procedure of connection using multiple Bluetooth devices in Microsoft Stack, please refer the following URL.

http://msdn.microsoft.com/en-us/library/aa916877.aspx

2.7.5 Simultaneous Use with WLAN

Since Bluetooth employs the same frequency range (2.4GHz ISM band), Bluetooth cannot be operated concurrently with WLAN. However, it is possible to make mutual interference less by following the instruction without turning off the power of either device.

- If the partner Bluetooth device supports AFH (Adaptive Frequency Hopping)
    AFH function automatically avoids the channels such as WLAN equipments are in use. But in some case, Bluetooth communication affects other communications such as WLAN.

- If the partner Bluetooth does not support AFH (exclusive use of Bluetooth and WLAN)
    - Confirm that WLAN communication has been finished before performing Bluetooth connection. If Bluetooth connection is performed while WLAN is used, radio wave from Bluetooth will significantly affect WLAN communication. Communication error by interference by Bluetooth radio wave can be reduced if Bluetooth communication is started after receiving data via WLAN.
    - Confirm that Bluetooth communication has been finished and Bluetooth connection is terminated before WLAN communication starts.
    - If another terminal fails to perform communication via WLAN/Bluetooth, keep the terminal away from this terminal as far as possible and start to operate Bluetooth again.
    - For WLAN communication to carry out, operate the terminal as close to Access-Point (for WLAN) as possible. As it is assumed that Bluetooth devices are operated near by the user, affect by interference mainly occurs on WLAN device. If the terminal distances from the Access-Point, affect by interference generated by Bluetooth device will increase causing LAN communication to fail. If this happens, place the terminal as near to the Access-Point as possible and operate WLAN communication again.

Note:
Even if either one of the methods described above has been determined to be effect, thorough check and assessment on the site and for system designs must be carried out prior to simultaneously operating Bluetooth and WLAN communications.

2.7.6 Communication Range

The communication range for Bluetooth communication between two Bluetooth devices should be 3 meters or less. If there is an obstacle exists on the path that blocks radio wave, the actual range may become shorter. Secure free path for maximum range.

2.8   WLAN

The IEEE802.11 b/g WLAN is operable with integrated WLAN module (model dependant). The IEEE802.11 b/g standard utilizes 2.4 GHz ISM ("Industry Science Medical") frequency band, which is used for short range wireless communication.

Device Name

On the terminal, the device name used to capture data, with **DeviceIoControl** function, about the WLAN driver is "SDIO86861".

2.8.1   Basic Features

Roaming

This function automatically switches Access-Point in environment where two or more Access-Points with identical SSID code exist.

Power Saving

This saves the power by automatically turning off the power to the integrated WLAN module in the terminal when communicating does not take place.

AdHoc

This operation mode provides a direct communication between wireless equipments without the use of Access-Point. Note, however, that the AdHoc mode is not recommended to operate because connection problem may occur.

WEP

This is an encryption that uses RC4 method for safe communication. It supports 40-bit (64-bit) and 104-bit (128-bit).

TKIP

TKIP supports against the weakness of WEP encryption.

AES
Advanced Encryption Standard (AES) is available for encryption method.

Enhanced Encryption

In order to address WEP vulnerabilities, the driver supports WEP key transmission, the new encryption method TKIP and the AES-developed TKIP. However, AES typically requires encoding and decoding hardware. The terminal supports AES and is compatible with WPA2.

802.1x Security

This can strengthen authentication and establish a safe and reliable communication via WLAN. In general, this interlinks with TKIP and AES. It supports PEAP-EAP-MS-CHAP-V2 and EAP-TLS.

2.8.2 Expanded Features

Power ON/OFF Control

The power to the integrated WLAN module can be controlled in application. Turning off the power when the WLAN module is not in use can save power, prevent line congestion and allow the on-board use of the terminal in aircraft. However, it is recommended to consult a cabin crew prior to use of it.

Operation Configuration File

The operation configuration file can be used to set each default value of the WLAN settings.

Resume Operation

After the terminal went into suspend mode and then returned in resume mode during wireless operation, this will automatically establish connection again with the Access-Point to enable continuous wireless communication.

Out of Range/In Range

This will automatically establish connection again with the Access-Point to enable continuous wireless communication when the terminal returns within the range from out side of the range of the Access-Point during wireless operation. This will automatically reconnect to the Access-Point if connection establishment with the Access-Point cannot be maintained due to noise or interference, or roaming is not possible for some reason.

2.8.3 Roaming

This feature automatically switches one Access-Point to another in where two or more Access-Points with the identical SSID code exist are installed.

1. Searches for Access-Points that can communicate with the terminal, and lists up radio wave status of each Access-Point.
2. Compares radio wave status of the currently connected Access-Point with those for the listed Access-Points.
3. If the comparison proves that one of the listed Access-Points has a better radio wave status than the one currently being connected with the terminal, the terminal will make a request of roaming to that Access-Point.
4. If roaming permission comes from the Access-Point to the terminal, the roaming will complete. Note that if the roaming fails, the connection establishment will be disconnected and then connected again.

Notes:
- In some cases, the Access-Point may request the terminal for forcible roaming or reconnection with another Access-Point.
- If connection establishment of the Access-Point being connected with the terminal is terminated due to some reasons such as turning off the power on it, the terminal may be forced to make a connection with another Access-Point.
- If it takes time for Access-Point to correspond for roaming request made by the terminal, the reconnection process may be initiated.
- If **DeAuthentication** or **DisAssociation** message issued by the Access-Point that is being connected with the terminal is received by the terminal after roaming completed, the connection establishment between the Access-Point and the terminal may be interrupted temporarily and then connected again.

2.8.4 Zeroconfig

This feature coordinates with the module firmware and the WLAN driver to perform some of the WLAN link management and the Network management.

- If multiple SSIDs are registered as prioritized connections, attempt to establish connection will be performed to each registered SSID. In this case, the interval of time period for reconnecting will become prolonged. If the reconnection time ranks important, register one SSID only as prioritized connection.
- Reconnection loop process will initiate when a disconnection notification is issued by the module, or when Association fails.
- The reconnection loop process will end when the terminal succeeds connection establishment with one of the multiple SSIDs registered as prioritized connections.

Connection Process

Zeroconfig will instruct the WLAN driver and the WLAN module to make connection when finding an Access-Point registered in the prioritized SSID list. Each firmware of the driver and the module both instructed initiates necessary process following the rule of IEEE802.11 b/g standard to make connection with the Access-Point. If multiple SSIDs are registered as prioritized connections in the prioritized SSID list, attempt to establish connection with each SSID will be made.

Disconnection Process

In the following cases 1 to 3, the connection establishment via WLAN with Access-Point will be disconnected. Firmware in the WLAN module judges on the disconnection and carries out the necessary roaming process.

1. When the radio wave quality in air deteriorates because of interference from other radio devices, noise, WLAN communication in the same channel with other WLAN device, or in adjacent channel.
2. When the terminal distances from Access-Point, or when radio wave weakens due to obstacle.
3. When another Access-Point that can allow roaming to avoid the poor conditions described in the situations 1 and 2 above cannot be sought.

Resume Process

The following processes are carried out when the terminal takes place in the resume mode.
- Unloading the driver
- Loading the driver
- Initializing
- Seeking Access-Point
- Creating the Access-Point list
- Establishing connection with Access-Point
- Changing the Tasktray icon

2.8.5 Channels

The no. of WLAN channels set by default at the factory is "1CH-13CH" (13 channels) compatible with the ETSI standard (EU radio standard).

2.8.6 WLAN Setting with Configuration File

The configuration file can be used to set the default values for the WLAN settings. By loading the configuration file into the terminal, setting to configure the WLAN operations can be easy.

- The configuration file is "\Documents and Settings\System Settings\WLANCFG.ini".
- If no configuration file is available, WLAN operation is initiated with the default settings.

Timing to Load the File

The timing for loading the configuration file is when a reset or a full reset is performed on the terminal. However, if any one of the following cases occurs, setting with the default values in the configuration file will not take place.
- The file itself does not exist.
- The format is wrong.
- "Disable configuration file" has been set in the WLANCFG parameter.

Creating Configuration File

The configuration file can be created and edited with **WLAN Settings tool** at the Control Panel. Using a general editor, a configuration file can be also created.
WEP key must be created in advance with an encrypted character string using the **WLAN Setting tool** and then copy and paste it to the configuration file. WLAN settings made with Microsoft's WLAN setting will be ignored in the configuration file.

File Format

The file format of configuration file is INI format which follows restrictions described below.

- The maximum size of the configuration file is 60 Kbytes.
- A line starting with ";" is regarded as comment. It does not regard as comment if located in mid-line.
- The separator for KEY and VALUE is "=". Space and tab, etc., also are included in either KEY or VALUE. If a space is inserted after "=", for example, in "SSID=　tunami", the SSID value includes the space ("　")+tunami.
- At the end of line, CR/LF or CR or LF must be attached.
- The maximum length of line is 256 bytes.
- Section name, KEY and VALUE are not case-sensitive.

WLAN Section

General setting for the WLAN settings is made in this section.

Table 2.65

KEY	VALUE
WLANPOWER	Set turning the power to the integrated WLAN module on or off. 　1: Power ON 　0: Power OFF
POWERSAVE	Set the power save mode effect selecting either value. 　1: Enable the power save. 　0: Disable the power save.
WLANCFG	Enable or disable the configuration file. 　1: Enable the file. 　0: Disable the file.
RoamingRSSILevel	Set roaming threshold value in dBm.
RoamingAvailableTime	Set time period in second to start roaming again.
RoamingRSSISpan	Set difference of roaming radio wave intensity in dBm.
BandConfig	Set communication speed selecting either value. 　0: IEEE802.11b 　1: IEEE802.11 b/g
MAX_SCAN_TIME	Set time period per channel in millisecond to seek Access-Point.
SCAN_CHANNELS	Set channels in successive hexadecimal codes to use. 　Example 　123456789ABCD : Choose all channels. 　16B　　　　　　 : Choose 1Ch, 6Ch, 11Ch.
WLAN_CFG_TOOL	Select a tool, either NETUI or WLANCONFIG, that appears when the WLAN icon is selected.

STATIC Section

This section specifies parameters necessary for the integrated WLAN module to establish connection with Access-Point.

Table 2.66

KEY	VALUE
SSID	Set SSID.
ADHOC	Set Infrastructure or AdHoc mode selecting either value. 　　1: Infrastructure 　　0: AdHoc
WEP	Set WEP to be included or not. 　　1: Without WEP 　　0: With WEP
KEYINDEX	Set WEP key INDEX in the range of 0 to 3.
KEYDATA	Using the WLAN Setting tool, set encrypted WEP key data selecting either value. 　　20 bytes for 40-bit WEP 　　52 bytes for 108-bit WEP
SECURITY	Set security selecting one of the values. 　　NONE 　　WEP 　　WPA 　　WPA2
AUTH	Set authentication selecting one of the modes. 　　OPEN 　　PEAP 　　TLS 　　PSK
WEP_OPEN_KEYINDEX	Set WEP key INDEX in Open Authentication in the range of 1 to 4.
WEP_OPEN_KEY	Set WEP key.
WPA_PEAP_USER	Set user name of WPA_PEAP.
WPA_PEAP_PASS	Set password of WPA_PEAP.
WPA_PEAP_DOMAIN	Set domain name of WPA_PEAP.
WPA_PEAP_VALIDATESERVER	Set WPA_PEAP server certificate to be valid or not selecting either value. 　　0: Server certificate invalid 　　1: Server certificate valid
WPA_TLS_DOMAIN	Set domain name of WPA_TLS.
WPA_TLS_VALIDATESERVER	Set WPA_TLS server certificate to be valid or not selecting either value. 　　0: Server certificate invalid 　　1: Server certificate valid
WPA_TLS_CERTIFICATE	Set friendly name of WPA_TLS client certificate.
WPA_PSK_KEY	Set WPA_PSK key length in the range of 16 to 128 bytes.
WPA2_PEAP_USER	Set user name of WPA2_PEAP.
WPA2_PEAP_PASS	Set password of WPA2_PEAP.

Continue.

WPA2_PEAP_DOMAIN	Set domain name of WPA2_PEAP.

WPA2_PEAP_VALIDATESERVER	Set WPA2_PEAP server certificate to be valid or not selecting either value.
	    0: Server certificate invalid
	    1: Server certificate valid

WPA2_TLS_DOMAIN	Set domain name of WPA2_TLS.

WPA2_TLS_VALIDATESERVER	Set WPA2_TLS server certificate to be valid or not selecting either value.
	    0: Server certificate invalid
	    1: Server certificate valid

WPA2_TLS_CERTIFICATE	Set friendly name of WPA2_TLS client certificate.
WPA2_PSK_KEY	Set WPA2_PSK key length in the range of 16 to 128 bytes.
NETWORK	0:The Internet 1:Work

Examples of Settings for STATIC Section

Example 1;   If WEP is used.

```
[STATIC]
SSID=tunami
ADHOC=0
WEP=1
KEYINDEX=0
KEYDATA= 5C1E1455A2D504920483C59EA19AC2AB3F12821273BD2A17A9BE
NETWORK=0
```

Example 2;   If WEP is used.

```
[STATIC]
SSID=tunami
SECURITY=WEP
AUTH=OPEN
WEP_OPEN_KEYINDEX=1
WEP_OPEN_KEYDATA=5C1E1455A2D504920483C59EA19AC2AB3F12821273BD2A17A9
BE
```

Example 3;   If WPA or PSK is used.

```
[STATIC]
SSID=tunami
SECURITY=WPA
AUTH=PSK
WPA_PSK_KEY=5C1E1455A2D504920483C5EABE
NETWORK=1
```

Example 4;   If WPA or PEAP is used.

```
[STATIC]
SSID=tunami
SECURITY=WPA
AUTH=PEAP
WPA_PEAP_USER=user
WPA_PEAP_PASS=pass
WPA_PEAP_DOMAIN=domain
WPA_PEAP_VALIDATESERVER=1
NETWORK=0
```

Example 5;   If WPA or TLS is used.

```
[STATIC]
SSID=tunami
SECURITY=WPA
AUTH=TLS
WPA_TLS_USER=user
WPA_TLS_DOMAIN=domain
WPA_TLS_CERTIFICATE=certname
WPA_TLS_VALIDATESERVER=1
```

TCIP/IP Section

This section sets the integrated WLAN module's IP address.

Table 2.67

Key	VALUE

DHCP	Set "Enable" or "Disable" on the DHCP. If "1: Enable DHCP" is selected, the subsequent settings are not necessary to set.
	    1: Enable DHCP.
	    0: Disable DHCP.

IPADDRESS	Set IP address.
SUBNETMASK	Set subnet mask.
DEFAULTGATEWAY	Set default gateway.
DNS1	Set primary DNS server address.
DNS2	Set secondary DNS server address.
WINS1	Set primary WINS server address.
WINS2	Set secondary WINS server address.

Example ; Configuration File

```
[WLAN]
WLANPOWER=1
POWERSAVE=1
WLANCFG=1
BandConfig=1
RoamingRSSILevel=-78
RoamingAvailableTime=15
RoamingRSSISpan=1
RoamingAvailableTime=60
BandConfig=1

MAX_SCAN_TIME=105
SCAN_CHANNELS=123456789ABCDE
WLAN_CFGTOOL=WLANCONFIG

[STATIC]
SSID=TSUNAMI
ADHOC=0
SECURITY=WEP=1
AUTH=OPEN
WEP_OPEN_KEYINDEX=01
KEYDATA= 5C1E1455A2D504920483C59EA19AC2AB3F12821273BD2A17A9BE
WEP_OPEN_KEY=516DFEC900486137CB9D8C82993F184B508A916F5B5E733A0159
NETWORK=0

[TCP/IP]
DHCP=0
IPADDRESS=192.168.1.100
DEFAULTGATEWAY=192.168.1.100
SUBNETMASK=255.255.255.0
DNS1=192.168.1.101
DNS1=192.168.1.102
WINS1=192.168.1.103
WINS2=192.168.1.104
```

2.9 WWAN

This chapter describes about detailed specifications of the integrated WWAN function.

2.9.1 Basic Specifications

The terminal (model dependant) supports the following communication protocols.

Table 2.68

GSM		
Standard		3GPP release 99
Features		Voice, Packet data
Data transfer	Packet	GPRS:　Multi Slot Class 12 　　　　Mobile Station Class B 　　　　Coding Scheme CS1-4 EGPRS(EDGE): 　　　　Multi Slot Class 12 　　　　Mobile Station Class B 　　　　Coding Scheme MCS1- 9
Band		GSM850 GSM900 GSM1800 (DCS1800) GSM1900 (DCS1900)
W-CDMA		
Standard		UMTS/W-CDMA : 3GPP release 99 HSDPA : 3GPP release 5
Features		Voice, Packet data
Data transfer	Packet	64Kbps, 128Kbps, 384Kbps Category 12 (1.8Mbps) Category 6 (3.6Mbps) Category 8 (7.2Mbps)
Band		Band I : 299 Band II : 299 Band V : 124 Band VI : 49 Band VIII : 174
SMS		Point-to-point MT and MO

2.9.2 Available Features

Packet Communication

This connects to the IP network.

Short Messaging

This transmits and receives brief messages via SMS network.

Voice Communication

This enables voice communication.

Library

User applications can be developed to support the WAN Communication functions using the WANGPRS Library. For detail, refer to the WANGPRS Library manual.

2.10 GPS Positioning Function

This chapter describes about detailed specifications of the GPS.

2.10.1 Basic Specifications

GPS module power is related with phone function, therefore when you want to use GPS function, please check Phone power condition in Wireless Manager is On status.
(Default setting is On.)

Figure 2-11
(GPS Unit Power ON condition)
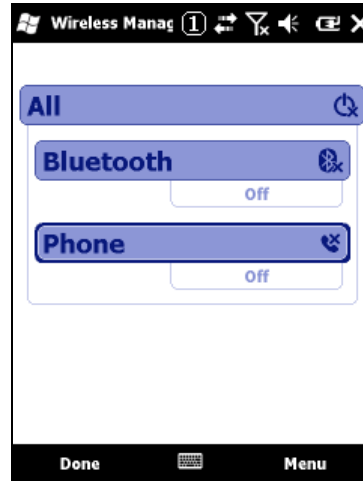
Figure 2-12
(GPS Unit Power OFF condition)

The terminal supports the following functions that come with the integrated GPS module.

Table 2.69

	Specification	Remarks
Positioning Method	Independent positioning	Module unit receives radio waves and performs positioning
Positioning status	Reception from 4 or more satellites: 3D positioning	Positioning cannot be performed with 2 or less satellites.
	Reception from 3 satellites: 2D positioning	
Output Format	NMEA - 0183	This is the standardized output format of the National Marine Electronics Association and is the standard format used with GPS.
Geodetic System	WGS84	WGS84 is a global geodetic system built and maintained by the U.S government. This global system is suited to operate in fields requiring real-time capabilities such as the military, navigation and nautical charting.

2.10.2 GPS Function API

Latitude and longitude data are obtained using independent positioning to provide the following functions.

- Obtains positional data from user application via the GPS intermediate driver (Windows Mobile standard GPS interface)
- Displays satellite reception status with the GPS Information tool

Note:
Refer to "GPS Information" with the GPS Information tool for detail.

The GPS intermediate driver provides GPS information in two ways.

- NMEA Format Data Output
- Positional Data using the GPS Intermediate Driver API

In addition, multiple user applications can simultaneously access the GPS intermediate driver to obtain positional data.

NMEA Format Data Output

The NMEA is an abbreviation for National Marine Electronic Association which provides electronic instrument and communication specification standards for shipping vessels. The NMEA-0183 output protocol is a standard for GPS receiver and navigation equipment communication via a serial port. It's widely supported by GPS equipment.

NMEA data can be output by accessing the GPS Intermediate driver's virtual COM port (COM8).

Note:
The integrated communication port is as follows.

Table 2.70

GPS intermediate driver virtual serial port	: COM8

The procedure for using the virtual serial port is as follows.

1. Open the virtual COM port with **CreateFile()**.
2. Read the NMEA character string with **ReadFile()**.
3. Analyze the NMEA character string to retrieve the positional data.
4. NMEA character strings are continually output for each GPS Module measurement. Repeat steps 2 and 3 above as required to retrieve continuous positional data.
5. Close the port with **CloseHandle()**.

NMEA Sentence Output

The NMEA-0183 is output in text format with each item separated by a comma (,) and sentences separated by a new line code (CRLF). The checksum is added up at the line end. The checksum calculates the XOR'ed value of character data enclosed by $, ' and * in hexadecimal string values.

Table 2.71

$	Sentence-identifying character	, value (, value)…	*Checksum	CRLF

Multiple sentence types are defined.

Some data containing broken sentences may be read depending on when the GPS is opened and read. NMEA sentence data can be properly interpreted use programming procedures such as those listed below.

- Detect head of sentence using $ character.
- Detect end of sentence using line break (CRLF) code.
- Discard broken sentences verified with checksum.

GGA Sentences

This displays GPS fix data.

Example of output:

$GPGGA,095635.00,3540.05802,N,13921.63542,E,1,06,1.54,212.5,M,39.2,M,,*59

Table 2.72

Item	Description	Validity
$GPGGA		Yes
095635.00	UTC time is displayed in the hhmmss.ss format.	Yes
3540.05802	Displays latitude. The value at the left shows a longitude of 35 degrees and 40.05802 minutes.	Yes
N	N and S indicate north and south respectively.	Yes
13921.63542	Displays longitude. The value at the left shows a longitude of 139 degrees and 21.63542 minutes.	Yes
E	E and W indicate east and west respectively.	Yes
1	Indicates GPS accuracy. 0 = no signal 1 = independent positioning	Yes
06	Indicates the number of satellites from which a signal is being transmitted.	Yes
1.54	Shows HDOP. The HDOP is the GPS coefficient of horizontal dilution. The smaller this value becomes, the more accurate the position.	Yes
212.5	Indicates the altitude above sea level.	Yes
M	Altitude unit: M = meters	Yes
39.2	Indicates the altitude from the WGS 84 Ellipsoid.	Yes
M	Altitude unit: M = meters	Yes
	Age of D-GPS data (seconds)	No
	DGPS base station ID number.	No
*59	Checksum	Yes

Note:

"Yes" indicates the presence of the valid output.

"No" indicates the absence of the valid output.

GSA Sentences

This outputs GPS DOP and active satellite data.

Example of output:

$GPGSA,A,3,13,17,28,04,02,23,,,,,,,2.38,1.54,1.82*09

Table 2.73

Item	Description	Validity
$GPGSA		Yes
A	Positioning mode A = 2D/3D auto-select M = 2D/3D manual-select	Yes
3	Positioning status 1 no signal 2 2D 3 3D	Yes
13,17,28,04,02,23, ,,,,,,	Satellites from which signal is being transmitted. Displays up to 12 satellites.	Yes
2.38	Shows PDOP. The PDOP is the coefficient of position dilution determined by the position of the GPS satellite/s. The smaller this value becomes, the more accurate the position.	Yes
1.54	Shows HDOP. The HDOP is the GPS coefficient of horizontal dilution. The smaller this value becomes, the more accurate the position.	Yes
1.82	Shows VDOP. The VDOP is the GPS coefficient of vertical dilution. The smaller this value becomes, the more accurate the position.	Yes
*09	Checksum	Yes

Note:

"Yes" indicates the presence of the valid output.

"No" indicates the absence of the valid output.

GSV Sentences

This outputs data on GPS Satellites in View.

GSV sentences show current data on the satellites from which a signal can be received. A single sentence contains data up to four satellites. Data on the fifth and subsequent satellites is output in multiple lines. In the example below, data is provided on eight satellites in two sentences.

Example of output:

$GPGSV,2,1,08,13,22,148,16,17,78,326,33,28,31,209,29,04,39,289,46*73

$GPGSV,2,2,08,11,26,083,21,20,51,047,,02,06,274,40,23,34,111,32*7F

The first sentence contains the following information.

Table 2.74

Item	Description	Validity
$GPGSV		Yes
2	Total message count	Yes
1	Message no.	Yes
08,	No. of satellites from which signal can be transmitted	Yes
13	Satellite no.	Yes
22	Elevation (degrees)	Yes
148	Direction (degrees)	Yes
16	Indicates the signal-to-noise ratio (SNR; dB) when receiving a signal. The higher the ratio, the better the signal.	Yes
Items 5 to 8 repeated 0 to 3 times		
*73	Checksum	Yes

Note:

"Yes" indicates the presence of the valid output.

"No" indicates the absence of the valid output.

RMC Sentences

This outputs data on the Recommended Minimum.

Example of output:

$GPRMC,095636.00,A,3540.05781,N,13921.63500,E,0.851,193.03,011107,,,A*62

Table 2.75

Item	Description	Validity
$GPRMC		Yes
095636.00	UTC time is displayed in the hhmmss.ss format.	Yes
A	Indicates status: A = data is valid. V = data is invalid during measurement.	Yes
3540.05781	Displays longitude. The value at the left shows a longitude of 35 degrees and 40.05781 minutes.	Yes
N	N and S indicate north and south respectively.	Yes
13921.63500	Displays longitude. The value at the left shows a longitude of 139 degrees and 21.63500 minutes.	Yes
E	E and W indicate east and west respectively.	Yes
0.851	Indicates ground speed (knots).	Yes
193.03	Indicates traveling direction (degrees).	Yes
011107	Shows the date (UTC) as ddmmyyyy.	Yes
	Geomagnetic variation (degrees).	No
	Indicates the direction of geomagnetic variations as a single letter, i.e. N, S, E or W.	No
A	Indicates positioning mode: A = independent positioning D = DGPS N = invalid	Yes
*62	Checksum	Yes

Note:

"Yes" indicates the presence of the valid output.

"No" indicates the absence of the valid output.

Positioning Data Using the GPS Intermediate Driver API

The Windows Mobile GPS intermediate driver provides an API to analyze NMEA character strings and obtain positioning data.

The GPS intermediate driver API can be used in the following procedure.

1. Create an event with **CreateEvent()** in order to detect GPS module status changes and output.
2. Connect to the GPS module with **GPSOpenDevice()**. GPS module status and positional changes can be registered for each event with **GPSOpenDevice()**. "Positional change" events actually indicate that NMEA output from the GPS module has been received. The GPS module generally outputs several lines of NMEA character strings each second.
3. Use **WaitForMultipleObjects()** or **WaitForSingleObject()** to wait for events.
4. When notification of a "positional change" is received, use **GPSGetPosition()** to retrieve the data. Positioning data can be retrieved from each member inside the GPS_POSITION structure. Some of the structural members are listed in the table below.

Table 2.76

Member	Format	Contents
DwValidFields	DWORD	The validity or invalidity of retrieved data is shown in Bits for each GPS_POSITION structural field.
stUTCTime	SYSTEMTIME	UTC time retrieved from the satellites is shown in SYSTEMTIME format.
dblLatitude	Double	Latitude is expressed in degrees. A positive value indicates northern latitude.
dblLongitude	Double	Longitude is expressed in degrees. A positive value indicates an eastern longitude.
flSpeed	Float	Traveling speed is shown in knots (nautical miles/hour)
flHeading	Float	Traveling direction is expressed in degrees. 0° represents true north.
FixType	GPS_FIX_TYPE	GPS measurement is shown in either 2D or 3D.

5. Repeat steps 3 and 4 as required by the application.
6. When positioning data is no longer required, the connection can be terminated with **GPSCloseDevice()**.

Figure 2.12 shows the flowchart of the procedure.

Note:
Depending on the design of application, it may also be possible to retrieve regular positioning data with **GPSGetPosition()** and status with **GPSGetDeviceState()** after opening the device with **GPSOpenDevice()** without having to register events.
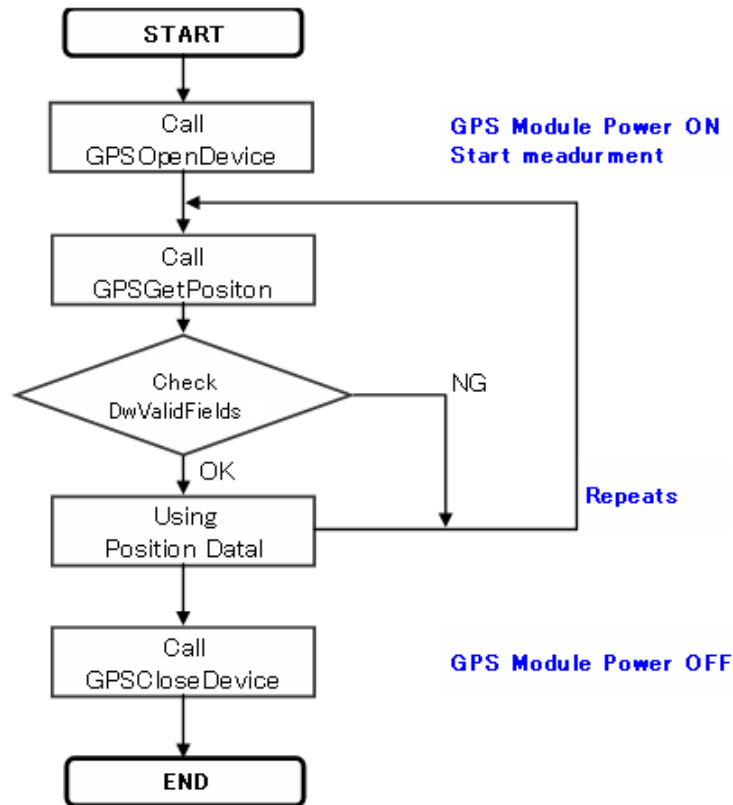
Figure 2-13

The functions relevant to the GPS intermediate driver API are as follows.

Table 2.77

Function	Description
GPSCloseDevice	Closes the GPS intermediate driver and connects to the GPS device.
GPSGetDeviceState	Retrieves the status of the GPS module.
GPSGetPosition	Retrieves GPS positioning data.
GPSOpenDevice	Opens the GPS intermediate driver and connects it to the GPS device.

Note:

The terminal does not support the GPS Intermediate driver's **DeviceIOControl** function.

2.11 MCR

This chapter describes the specifications of the MCR functions. The functions incorporated in the terminal are as follows.

- Read/Analysis function
- Read completion notification/Error notification function
- Track specification function
- Automatic Power OFF function
- Raw data retrieve function

2.11.1 Read, Analysis Function

This function serves to pass through (run) magnetic card in the MCR unit and read data on the magnetic card. Since the data read from the magnetic card contains preamble, STX, etc., in addition to the data, the MCR driver will extract only the necessary data after removing other data. With the MCR Library the user can make use of data retrieved from the magnetic card.

The function of the MCR Library relevant to the "Read, Analysis Function" is as follows.

   MCRRead   : Retrieves data read by the magnetic card reader.

Data Analysis for Each Track

Magnetic card has an area called "Tracks" in which data is written. The magnetic card can have a maximum of three tracks.   MCR can read data on the following three tracks at a time. It also removes the parity contents from the entire data to extract only effective data, and store it into the buffer provided by application program. The following track data formats described in the table below, ISO1, ISO2 and ISO3, can be read with the MCR.

Table 2.78   Applicable standards and specifications

Applicable standard	ISO1	ISO2	ISO3
Recording capacity	7 bits x 79 characters	5 bits x 40 characters	5 bits x 107 characters
Effective data length	1 to76 characters	1 to 37 characters	1 to 104 characters
Data format	6 bits + 1 parity	4 bits + 1 parity	4 bits + 1 parity

Application program should secure a buffer and pass it to the argument of **MCRRead** function of the MCR Library to retrieve data on each track as well as the read status. The data length can also be retrieved. "0" is returned as the length if no data is written on the specified track or read is performed on track not specified.

2.11.2 Read Completion and Error Notification

Read Completion Notification

The terminal will notify application program of the fact that the read/analysis of data or raw data retrieve is completed at that point in time. The notification method can be either by event or by message, and the initial setting is the latter. (This notification method can be modified with **MCRSetEventNotification** function) In case of notification by message, a message of WM_MCR_READING defined in the **mcrlib.h** header file will be posted when data read/analysis is completed. When application program passes the window handle to the MCR driver when it is opened, notification of this message will be posted to the handle, however, if the application program does not pass the window handle (i.e. specifies NULL), the message will then be broadcasted. If the notification method is specified as "by named event", a named event that is defined in the registry of the terminal will be posted (this event name can be modified through the registry; the initial setting is **MCREventReading**). Therefore, an application that has set up the notification method to "by event" must use **WaitForSingleObject** function, etc., to wait for a data read/analysis completion event.

Note:
Before a read/analysis completion notification is posted, the initial condition (0) is stored both as data and error information. As a result, if the application attempts to retrieve data just before the notification, it may get the data being currently written. Therefore, data retrieve must be made only after the event has occurred.

The functions of the MCR Library relevant to the "Read Completion and Error Notification" are as follows.

MCRSetEventNotification : Sets up the notification method for data retrieve.
MCRGetEventNotification : Retrieves the data retrieve notification method.

Error Notification

If an error occurs when data retrieve is performed with the library function, the error status will be saved accordingly in either StatusISO1, StatusISO2, or StatusISO3 (if data retrieve is successful, MCR_DATA_SUCCESS will be saved, and the data information of the track will be stored in the data storage buffer DataXXX[]).
The following table lists the error contents.

Table 2.79   List of error contents

Error	Description	Details
MCR_NO_DATA	No retrieved data.	Card data is not retrieved.
MCR_DATA_SUCCESS	Data retrieve successful.	Card data retrieve is normally terminated.
MCR_BUFFER_FULL_ERROR	Buffer full error	Acquired more than the specified amount of data.
MCR_DATASHORT_ERR	Min. data error	Minimum required data does not exist.
MCR_DATA_ERR1	Pre-data continuous 1 error	Data retrieve stopped because "1" continues.
MCR_DATA_ERR2	Data section continuous 1 error	Data retrieve stopped because "1" continues.
MCR_PULSE_ERR1	Min. pulse error	Detected a pulse below Minimum value.
MCR_PULSE_ERR2	Max. pulse error	Detected a pulse above Maximum value.
MCR_TIMEOUT_ERR	Timeout error	Card running time is timeout.
MCR_CARDSPEED_ERR1	Acceleration error	Abnormal acceleration during card scanning.
MCR_CARDSPEED_ERR2	Deceleration error	Abnormal deceleration during card scanning.
MCR_PARITY_ERR	Character parity error	Parity error in the retrieved data.
MCR_STX_NOTFOUND	STX detection error	Could not detect STX
MCR_ETX_NOTFOUND	Detection error	Could not detect ETX
MCR_PACKET_LRC_ERR	Packet LRC error	LRC error of the packet.

2.11.3 Designating Track

Under the default conditions the data read/analysis operation is performed on all the tracks (Tracks 1 to 3). However, it is possible to designate the target track to perform data read/analysis in application program, if using the library functions.

The function of the MCR Library relevant to the "Designating Track" is as follows.
 MCRSelectTrack   : Chooses a specific track to retrieve data.

2.11.4 Automatic Power OFF

The user can automatically turn off the power to the MCR if a given period of time elapses. The MCR power is basically turned on when **MCROpen** function is carried out, and turned off when **MCRClose** function is carried out. However, **MCRSetAutoPowerOff** function turns the MCR power to off after elapse of a given time period even if **MCRClose** function is not carried out (The MCR cannot be used while the power is off). To resume the MCR power again from the Automatic Power OFF condition and activate the MCR, use **MCRResume** function.

The functions of the MCR Library relevant to the "Automatic Power OFF" are as follows.

MCRSetAutoPowerOff : Turns off the power to the magnetic card reader when a specified time period elapses.

MCRGetAutoPowerOff : Retrieves the time period of countdown.

2.11.5 Raw Data Retrieve

By having a magnetic card run through the MCR, raw data itself magnetized in the card can be retrieved. Because the data is raw retrieved directly from the MCR, data process such as data error detection is not carried out. Any one of the errors listed below if occur will prevent from retrieving raw data.

- ➢ Buffer full error
- ➢ Min. data error
- ➢ Pre-data continuous 1 error
- ➢ Post data continuous 1 error
- ➢ Min. pulse error

The function of the MCR Library relevant to the "Raw Data Retrieve" is as follows.

MCRReadRaw : Retrieves raw data read by the magnetic card reader.

2.12 Printer

This chapter describes the functional specifications of the printer installed as standard in the terminal. The printer has the following functions incorporated:

- Printing function
- Detecting function

* The 82.55 mm printer has the same specification as the 80 mm printer.

2.12.1 Printing Functions

The printer has the following two major functions:
- Printing character fonts/bit images using CASIO original API
- Printing through the print system

Printing with CASIO-original API

Printable fonts

In addition to 4 types of ANK multi-fonts/3 types of Kanji fonts, printing in one of the 25 sizes (5 sizes for each of the vertical direction and the horizontal direction) and four types of character decoration can be performed.

Character font

The following types of ANK, Kanji, and OCR-B fonts are provided.

Table 2.80

Type	Font	Remark
ANK	6 x 7 dot font	
	6 x 12 dot font	
	8 x 16 dot font	
	12 x 24 dot font	
Kanji	12 x 12 dot font	JIS Level 1 and Level 2 codes
	16 x 16 dot font	
	24 x 24 dot font	
OCR-B	16 x 30 dot-font	
	24 x 25 dot-font	

Input code

With this printer the user can use Unicode or ANK (0x20 to 0xFF, and Shift JIS) to specify the character code to be printed.

Character code table (available if ANK font is specified)

Tables 2.53 and 2.54 show the ANK Character Code Table (0x20 to 0xFF).

Table 2.81

Character Code Table	Description
Expanded Graphics Code	Character code table incorporating IBM graphic characters from and after 80h.
Katakana Code	Character code table incorporating half-square Katakana characters from and after 80h.

International character set

The following character font table is "International Character Set" which becomes valid only when ANK is specified as input code. It describes deviations of the character set by country. Even if the character code is the same, a font specified by the corresponding character code may not be the same. The table shows that some of the ANK codes are replaced with local character fonts of the specific countries. Numbers in row represent the countries and numbers in column represent the character codes.

0. USA   1. France   2. Germany   3. England

4. Denmark   5. Sweden   6. Italy   7. Spain

8. Japan

Table 2.82   International Character Set

	0	1	2	3	4	5	6	7	8
23h	#	#	#	£	#	#	#	₧	#
24h	$	$	$	$	$	¤	$	$	$
40h	@	à	§	@	@	É	@	@	@
5Bh	[	°	Ä	[	Æ	Ä	°	¡	[
5Ch	\	ç	Ö	\	Ø	Ö	\	Ñ	¥
5Dh	]	§	Ü	]	Å	Å	é	¿	]
5Eh	^	^	^	^	^	Ü	^	^	^
60h	`	`	`	`	`	é	ù	`	`
7Bh	{	é	ä	{	æ	ä	à	¨	{
7Ch	|	ù	ö	|	Ø	ö	ò	ñ	|
7Dh	}	è	ü	}	å	å	è	}	}
7Eh	~	¨	ß	~	~	ü	ì	~	~

Character size

For each standard size, a total of five enlargements including x1, x1.5, x2, x3, and x4 are supported.
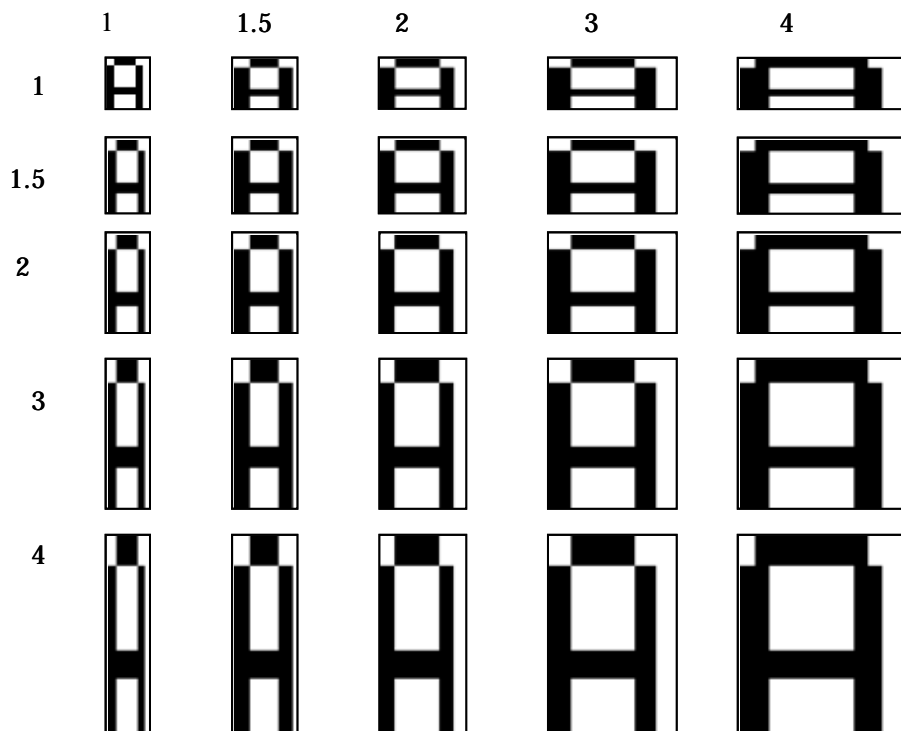
Figure 2.14

If a no-paper error occurs during the printing of enlarged characters, some of the characters may not be printed.

Note:
The enlargement for OCR-B fonts is not supported.

Character decoration

Determine the appearance of each character by combining the following four kinds of decorations. The following precautions must be kept in mind when each kind of decoration is used.

Table 2.83

Decoration	Remark
Reverse	Since this greatly increases the printing duty, power consumption will increase while printing speed decreases accordingly.
Bold	The objective letter becomes thicker in the horizontal direction.
Light	Since one of every two dots will not be printed, as a result of light printing, printed letters, if their character size is smaller than x2, may be illegible.
Smoothing	Applicable to letter sizes greater than double the original font size both in the vertical and horizontal directions. However, this smoothing will not be applied to other fonts, but only to the Mincho font (24-dot font).

Notes:
- Decoration of the enlarged font will be applied to the image that is the result of the enlarged font.
- No decoration can be applied to OCR-B fonts.
- If more than one kind of the decorations is specified, they will be applied in the following order:

    Smoothing $\rightarrow$ Bold $\rightarrow$ Reverse $\rightarrow$ Light

Smoothing
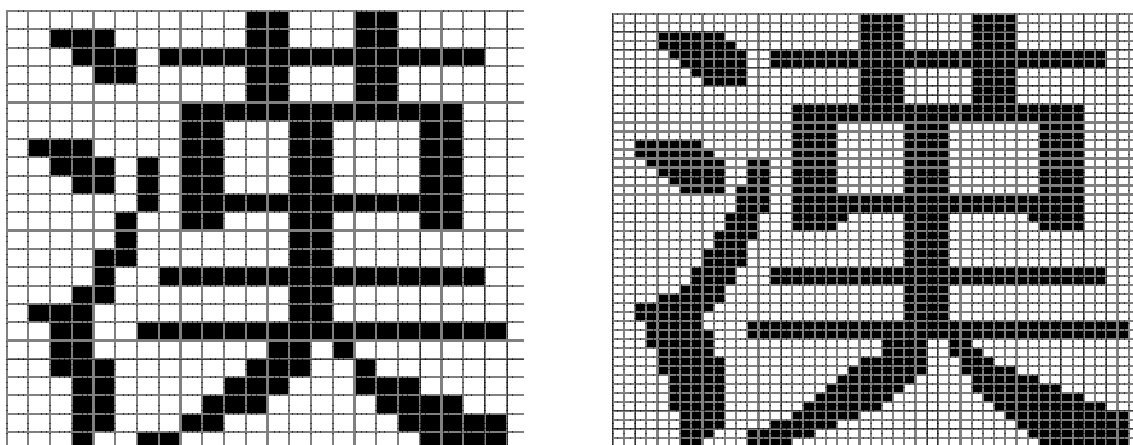
Figure 2.15

Bold, Reverse, Light

| Nrmal | Bold | Reverse in white/black | Light |

| Bold and reverse | Bold and light | Reverse and light | Bold, reverse and light |
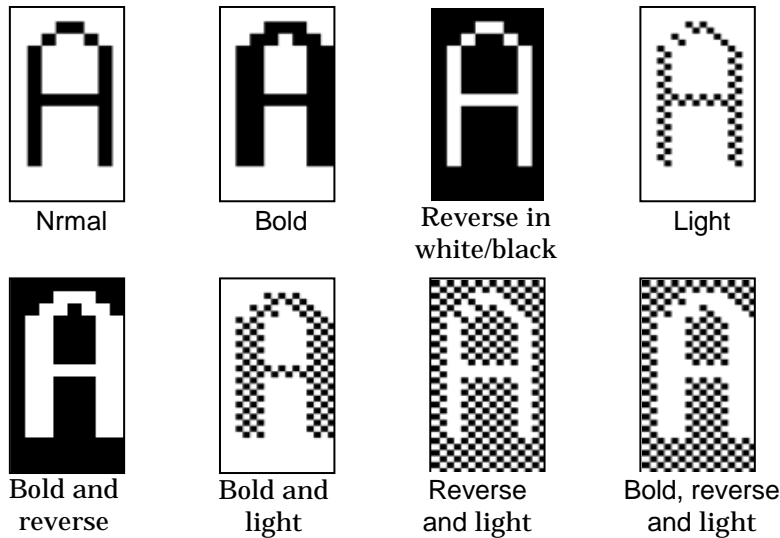
Figure 2.16

Printing functions

The following two major printing functions are incorporated into this printer: printing the character font and printing the bit image.

Print start conditions

The printer will commence its printing job when the print start conditions listed below are met.
- When CR, LF, and FF codes are output (if CR and LF codes are input successively, LF will be ignored).
- When one line becomes a full.
- When printing of the bit image (including a bit map, screen image, etc.) is attempted.

Paper width

For this printer it is possible to specify the paper width, either 80 mm or 58 mm, to be used through the Printer Library functions.

Notes:
- It is always necessary to specify the proper paper width for the paper to be used.
- If an attempt is made to print on 80 mm width paper on the printer which has just printed a 58-mm width paper, the printed results may be blurred. For this reason, the user is not permitted to change the setting to an 80 mm setting after printing on 58 mm paper width.
- If the paper width setting is changed, the setting of the right and left margins will be reset to 0.

The functions of the Printer Library relevant to the "Paper Width" are as follows.

PRNSetPaperWidth   : Sets up paper width.
PRNGetPaperWidth   : Retrieves the current paper width.

Printing paper

The user must specify the print paper type with the ESC command (Set Paper). The recommended paper types are shown below:

Table 2.84

Paper	Description
F-220VP	1-ply (high sensitivity)
HA220AA	1-ply (standard)
AFP-235	1-ply (for long-term storage)
HW54S	Label
ODT60TC-RAK	1-ply (thin paper)

Notes:
1. If 2-ply paper is used, set also the print speed to the graphic printing mode.
2. Perform this paper type specification only after the printing operation stops (i.e. after carrying out the ESC command (Discharge Unprinted Characters)). If the paper type specification is changed during printing, the print quality may be adversely affected because the data currently being printed will continue to be printed according to the parameters specified for the new paper type.

Print density

The user can specify the print density with the ESC command "Specify print density". The print density can be specified to one of 9 levels.

Notes:
- Perform this print density specification only after the printing operation stops (i.e. after carrying out the ESC command "Discharge non-printed characters").
- If the print density specification is changed during printing, the print quality may be adversely affected because the data in the mid-course of printing is printed at the newly specified density.

Print speed

One of the following print speeds can be specified with the ESC command "Specify print speed".
- Slow print (High-quality print)
- Quick print
- Graphic printing mode

It is possible to print text or graphics according to any of the print speeds above. However, if the graphic printing mode is specified, the actual print speed will be substantially slower in order to improve the print quality.

Notes:
- Perform this speed after the printing operation stops (i.e. after carrying out the ESC command "Discharge non-printed characters").
- If the print speed is changed during printing, the data currently being printed continues to be printed at the same speed before change is mad which also results in a deterioration of the print quality.

Feed in Forward

It is possible to specify the forward feed with the ESC command "Specify forward feed". The
forward (positive) feed amount can be set up in the range of 0 to 255 dots or in the range of 0 to
255 mm.

Continuous printing after error

If an error occurs, the printing operation instantly stops. Subsequently, the user can make a
decision as to whether the printing operation is to be continued after canceling the error. To
specify continuous printing after an error use the ESC command.

Character fonts

The following setup parameters can be specified for printing character fonts:

Table 2.85

Parameter	Description	
Font	Possible per character to be specified.	6x7, 12-dot, 16-dot, 24-dot, OCR-B
Size	Possible per character to be specified.	x1, x1.5, x2, x3, x4
Decoration	Possible per character to be specified.	Bold, reverse, light, smoothing (only for 24-dot mode)
Pitch between characters	Possible per line to be specified.	0 to 96 dots. Valid on and after the next line, if specified in the middle of line. The standard pitch between characters is for half-sized characters (Alphabet Numerals and Katakana (ANK)). For full-sized characters (Japanese kanji characters), the pitch is double the standard pitch width value. Note that even if you change the font size, the pitch width that has been set will remain unchanged.
Pitch between lines	Possible per line to be specified.	0 to 96 dots. Valid on and after the next line, if specified in the middle of line.
Buffer full printing	Possible per character to be specified.	Possible to specify "Enable" or "Disable".

Mixed character fonts

It is possible to print a mixture of different character fonts, character sizes, character decorations
within one line. The employed line-to-line interval shall be the maximum size (character height)
of the letters contained in that line.

Pre-heating

If the head temperature is too low in a low-temperature environment, it is recommended to automatically raise the head temperature before commencing the print job. This is intended to improve the print quality at low temperature. While the pre-heating continues, the icon shown below appears at the Task tray.

Note:
If at a substantially low temperature, it may take more than 1 minute for the head temperature to reach a sufficient level.

Holding the head temperature

The terminal features with the "pre-heating" function described above which makes the printer's head become warm for printing in good quality while it is used at a low temperature. However, it takes a while before the temperature becomes an optimum temperature level. The head temperature hold function will hold always the temperature on the head at a certain temperature level or for a certain preset period only. This makes the pre-heating period become shorten.

Notes:
- Monitors the head temperature periodically.
- Raises the head temperature to an optimum temperature level if the temperature has not reached yet.
- Stops the head temperature to rise if the temperature has reached to an optimum temperature level.
- Curbs the head temperature to become a hot while the terminal is mounted on the cradle or powered by the AC Adaptor. This is to make the installed battery pack charged.
- If once the head temperature hold function is set up enabled, it will continue to hold the temperature even if **PRNClose** function is carried out (The APO function activates following the presetting).
- The time period of holding the head temperature can be set up to either "always" or for one hour (maximum) in increment of five minutes. The specified time period commences when the ESC command (ESC p n) is sent last until the preset holding time elapses. The holding time period is counted during printing but, not during suspend.

Orientation

This function can be implemented by flipping the character fonts. However, only character fonts that have equal enlargements in both vertical and horizontal directions can be flipped. This specification can be made at the head of a line. If it is made in the middle of line, it is ignored. This specification continues to be valid until it is canceled.
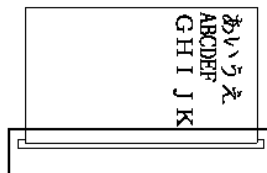
Figure 2.17

Note:

For the ANK fonts the printed results may vary depending on the fonts that existed before and after the ANK font, as shown below (see example nos. 1 and 2.).

1. If an even number of codes of an identical font and size are continuously output (eg. " ABCD   ").
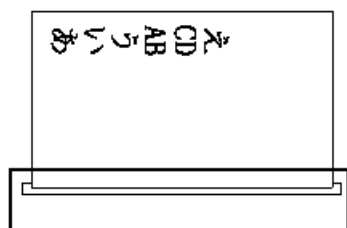
Figure 2.18

2. If an odd number of codes of an identical font and size are continuously output (eg. " ABC   ").
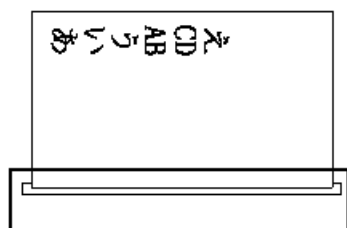
Figure 2.19

One of the following four orientations can be specified:

Cancelled   Right (90 degree)   Invert (180 degree)   Left (270 degree)

Notes
- The specification of orientation shall be made at the beginning of the line. If it is made in the middle, it is ignored. This specification continues to be valid until it is canceled.
- It is not permitted to flip 6x7-dot mode fonts and OCR-B fonts.
- Only character fonts that have equal enlargements in both vertical and horizontal directions can be flipped.
- The orientation once it is set up continues to be valid until it is canceled.

Buffer full printing

It is possible to switch the buffer full printing with an appropriate ESC command to enable or disable. The operation after switching is as follows:

- **If buffer full printing is enabled**

  If character codes are being printed and if the line buffer is full before the print start conditions are met, a whole single character that may extend beyond the right margin will be printed on the line following a line feed. For example, in the case of 16-dot Kanji characters, thirty-six characters can be printed on a line if the character-to-character spacing is specified as being zero. In this case, if the thirty-seventh character is a character code, this will be printed at the top of the next line after the thirty-six characters have been printed and a line feed has effected.
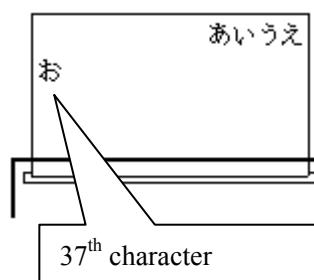
Figure 2.20

- **If buffer full printing is disabled**

  Character codes received after the character that extends beyond the right margin and before the print start conditions are met are ignored.

This character (" "), which comes at the end of a line, will be ignored, since it is not fully contained within the line. In addition, this line will be successfully printed when the print start conditions are met (output of CR/LF).
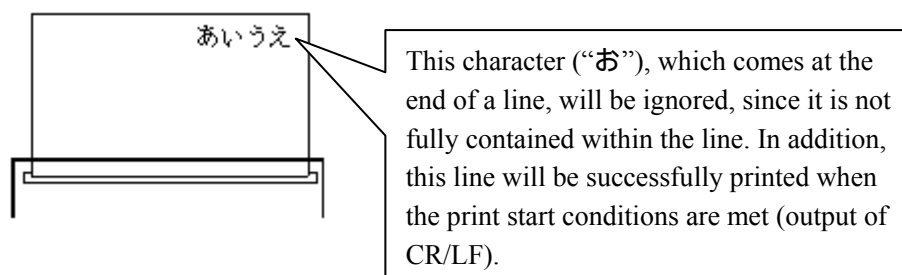
Figure 2.21

Printing stamps

It is possible to register image data and use it as a stamp.

No. of registered images   : 1 piece

Size   : An optional size can be specified at 8-dot increments in the
horizontal direction and 1-dot increments in the vertical direction.

Table 2.86

Item	Paper width 80 mm	Paper width 58 mm
Max. data size that can be registered	6912 bytes (72 bytes x 96 dots)	4608 bytes (48 bytes x 96 dots)
Max. horizontal size	576 dots	384 dots
Max. vertical size	96 dots	96 dots

Configuration example:

Case of 32 dots horizontally x 40 dots vertically
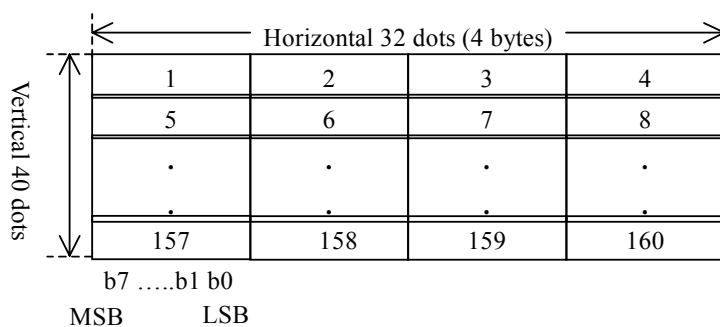
Figure 2.22

Printing the bit image:

This function prints the specified number of dot-lines of image data. Since a full dot-line of data is 576 dots (72 bytes) long for an 80 mm width paper, send it to the printer after subtracting the number of dots taken up by the right and left margins, if they are specified. If, for example, 40 dots are specified for each of the right and left margins (each margin can be specified in 8-dot units), the data length of one dot line will be 576 - (40 + 40) = 496 (62 bytes).
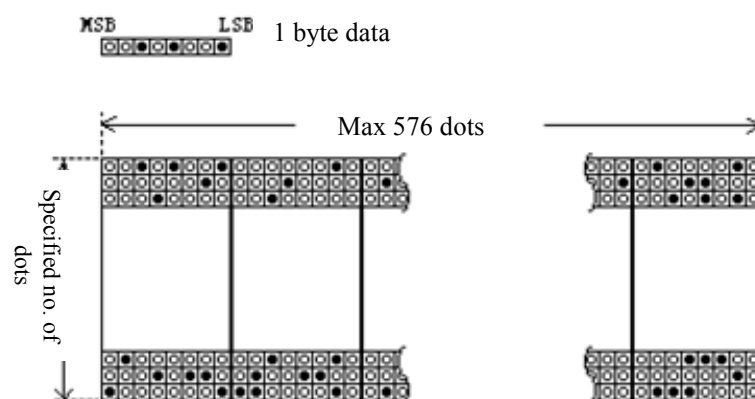
Figure 2.23

Bitmap file

The 2-scale (monochrome) bitmap file can be printed through the Print Library.

The functions of the Printer Library relevant to the "Printing Bit Image" are as follows.

  PRNImageOut : Prints out bit image.
  PRNBMPOut : Prints out specified bitmap.

Printing screen

This allows you to print the screen (to make a hard copy). If the left and right margins have been set, the size of the image will be scaled down so that it fits within these margins when it is printed out.

Printing window

This allows you to print a specific window. If the left and right margins have been set, the size of the image will be scaled down so that it fits within these margins when it is printed out.

Composite printing of bit image:

It is possible to combine text and a bit image for print out.

Bit image

AB ◄ —————————— ► Text

CD ◄
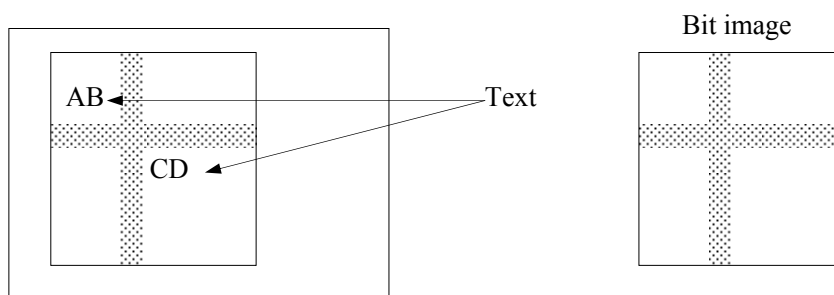
Figure 2.24

Printing user-defined fonts:

It is possible to register 128 user-defined fonts. The font sizes that can be registered are 24-dot, 16-dot, and 12-dot. To assign more than one size of font (24-dot, 16-dot, 12-dot) to the same character code, each font size must be registered. If a character code to which no font is defined is specified, a double-square space is output for the printer. User-defined fonts must be registered in the following range:

Table 2.87

Input code	Range of registration
Unicode	0xE100 to 0xE17F
ANK (Shift-JIS)	0xF185 to 0xF247 (excluding 0xF1FD to 0xF23F)

Configuration of user-defined font:

The user-defined fonts of 12-dot, 16-dot and 24-dot consist of the image data of 24, 32 and 72 bytes, respectively.

12-dot mode	16-dot mode	24-dot mode
12 dots + 4 dots (dummy)	16 dots	24 dots
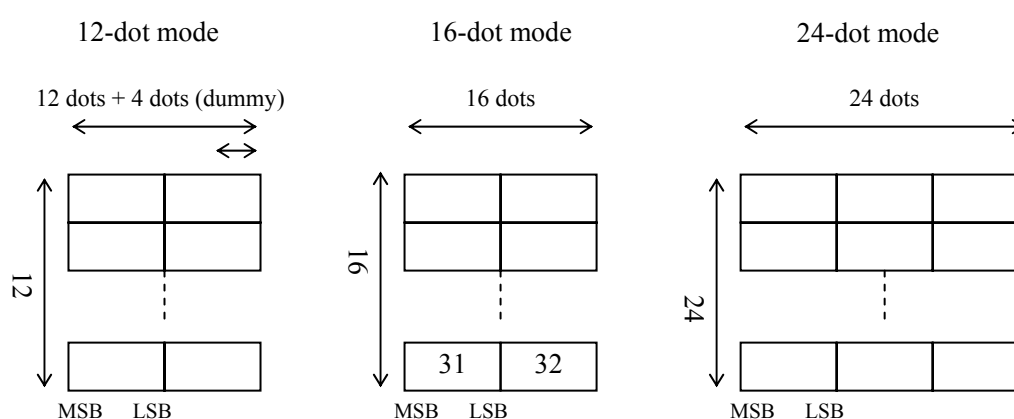
Figure 2.25

Note:
The horizontally arranged data of 12-dot fonts shall be 2 bytes as a result of adding 4 dummy dots.

Data configuration example of 12-dot font
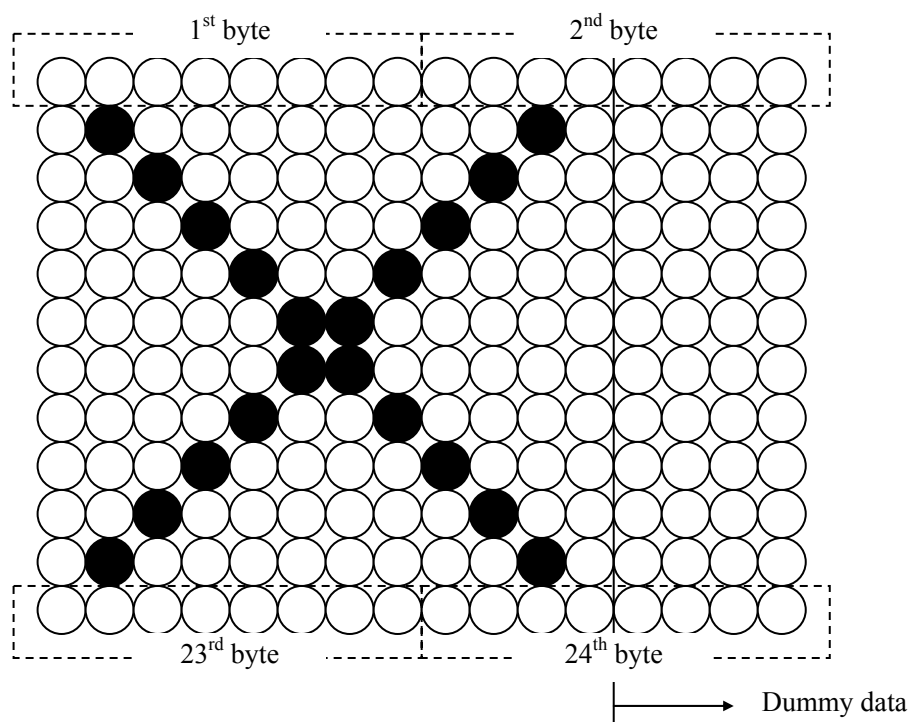
Figure 2.26

Prohibiting APO during printing

Disable the APO function through the Printer Library (**PRNOpen** function) to prevent the APO from being active during printing. If the Printer Library function is carried out after printing is completed, the APO function will be automatically restored to the setting before the printing started.

Note:
Since **PRNOpen** and **PRNClose** functions control the APO operation, do not allow the user application to control it while the printer is being used.

CPU control while using the printer

While the printer is in use (between PRNOpen and PRNClose of the Printer Library function), the CPU speed is locked at high speed for high-speed processing. When the printer is not in use, use the Printer Library to close the printer.

Printer power

The power supply to the printer is turned on as long as it is being used (from when **PRNOpen** function is called and until when **PRNClose** function is called through the Printer Library).

Printing bar codes

With the printer the following 1D symbologies can be printed through the CASIO original API.

The function of the Printer Library relevant to the "Printing bar codes" is as follows.

PRNBarcodeOut : Prints out specified bar code.

Printable symbology

The following 1D symbologies can be printed. Specify a desired symbology by making use of the API.

- JAN
- UPC-E
- NW-7
- Code39
- ITF
- Code128 (EAN128)   See note below.

Note:
The EAN-128 can also be printed out if Code128 is specified and it is made to meet the EAN128 data format. However, it is not permitted to print an AI (Application Identifier) enclosed by a pair of parentheses as ( ).

Height of bar code

It is possible to specify, in millimeter units, the bar code height to be printed. The allowable specification range is as follows:
Height: 1 to 63 mm (when 58-mm paper width is used: 1 to 39 mm)

CD (Check Digit):
It is possible to calculate the check digit and specify whether it is added to the bar code.

Table 2.88

Symbology	Specifying Check Digit	Check Digit
JAN	To be added always.	Modulo 10
UPC (UPC-E)	To be added always.	Modulo 10
NW-7	To be eliminated always.	---
Code39	To be added/not to be added	Modulo 43
ITF	To be added/not to be added	Modulo 10
Code128	To be added always.	Modulo 103

Printing data:
It is possible to specify the character font of bar code data to be printed below the bar code. With this specification it is also possible to disable printing of the bar code data.

- Standard character (ANK 8 x 16 dots, enlarged to double in the horizontal and vertical directions)
- Reduced character (ANK 6 x 7 dots, enlarged to double in the horizontal and vertical directions)
- OCR-B I
- Does not print.

Left margin

Specify the space to be provided to the left of the bar code in the millimeter unit.

- 0 to 69 mm (or, 0 to 45 mm for 58-mm paper width)
- Automatic centering

Orientation of printing:

Specify the orientation to print a bar code.

- Printing in the vertical direction
- Printing in the horizontal direction
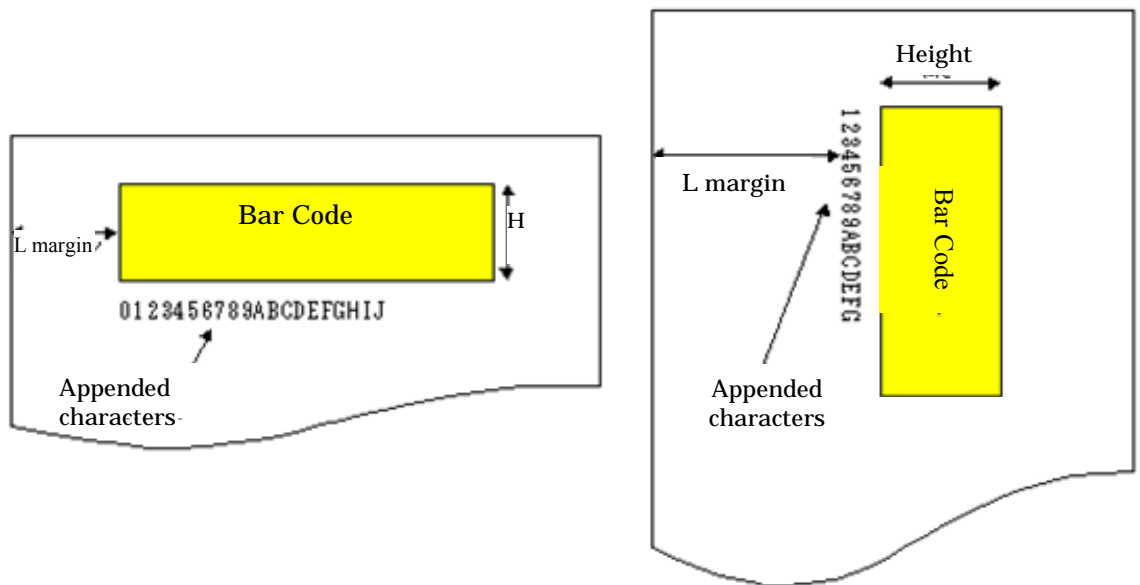
Figure 2.27

Data correction:

JAN

- Accepts only the data in 7, 8, 12, and 13 digits.
- 7 and 8-digit data, and 12 and 13-digit data are printed in the reduced format and in the standard format, respectively.
- 7 and 12-digit data are automatically added with C/D, and 8 and 13-digit data will be re-calculated.

Code39

- If data does not have asterisks "*" before and after it, they are automatically added.
- If there is an asterisk "*" in the middle of data, an error results.

NW7

- Even if the addition of C/D is specified, it is not implemented.
- If any characters between A and D exist in the middle of data, or if the data does not begin with a start character and end with a stop character, an error results.
- Characters between A and D are not interpreted on a case-sensitive basis.

UPC-E

- Accepts only the reduced format of data.
- If any data is entered before reducing it, an error results.

ITF

- If data forms with odd number of digits without a C/D, "0" is added to the beginning.
- If data forms with an even number of digits including a C/D, "0" is added to the beginning.

Code128

- Specify, as required, the start character, function character, code-set character, shift character, and data character for the data.
  (The above mentioned characters and stop character are, in general, called symbol characters. Symbol characters other than data characters are called a special symbol character.)
- For an ASCII code between 00h and 1Fh, "\", "#", ",", and any one of special symbol characters, special notation that adds a prefix of "\" will be used. This data will first be replaced with a symbol character and then evaluated as the data (the notation method is described later).
- If the start character is not specified, either the Code Set A or Code Set B is automatically selected depending on the data character that appears first. However, if the code-set character appears earlier than the data character, it is replaced with the start character. Note that the use of Code Set C must be explicitly specified, since it cannot be automatically determined. In addition, if a start character is specified in the middle of the data, error (2) occurs.
- A function character is not automatically inserted. It must be specified as necessary. However, since no check is made to determine whether the function character is correctly used, an error may result on decoding the data.
- A code-set character is automatically inserted. In addition, unnecessary code-set characters are automatically eliminated.
- A shift character is not be automatically inserted.
- An error of (2) results if any character (80h to FFh) that is not permitted for use is specified.
- The objective data of Code Set C encoding shall consist of an even number of consecutive numerical strings after Code Set C is shifted to. If the number of strings is odd, and error of (2) results. More than two sets of even number of strings, if properly separated by FNC1, do not result in an error. If any data other than numerical data and FNC1 appears, other code set is automatically shifted to.
- A stop character is automatically appended.
  All pieces of data except a code that ignores everything from the top to the delimiter shall be handled as the objective of printing. Therefore, if a space is contained in the data, a data error causes for codes other than Code39 or Code128.

Code128 symbol characters and their notation method:

- Start characters
  If the start character is not specified, it is automatically determined from the character placed at the top of the data. However, for using Code Set C, it is necessary to specify "\sC".

Table 2.89

Character	Notation
START A	\sA
START B	\sB
START C	\sC

- Function characters
  Since it is not automatically inserted, specify an appropriate function character as required.

Table 2.90

Character	Notation
FNC1	\f1
FNC2	\f2
FNC3	\f3
FNC4	\f4

- Code-set characters
  Shifting to CODE A or B of the code-set characters is automatically performed. However, it is necessary to explicitly specify "\sC" for shifting to Code Set C. To shift from Code Set C to another code set it is necessary to specify either "\sA" or "\sB". But, if a character belonging to another code set appears under the condition where Code Set C is being specified, shifting to that code set is automatically performed.

Table 2.91

Character	Notation
CODE A	\cA
CODE B	\cB
CODE C	\cC

- Shift character
  When the shift character is described, only the character shown below is shifted from Code Set A to B, and from Code Set B to A. This character is not automatically inserted.

Table 2.92

Character	Notation
SHIFT	\sF

- Stop character
  This stop character is automatically inserted. There is no data notation method to describe it.

Table 2.93

Character	Notation
STOP	None

- Data characters

Table 2.94

Code	Chara. notation	Hexadecimal notation	Code set	Code	Chara. notation	Hexadecimal notation	Code set	Code	Chara. notation	Hexadecimal notation	Code set
00		\x00	A	30	0	\x30	AB	60	'	\x60	B
01		\x01	A	31	1	\x31	AB	61	a	\x61	B
02		\x02	A	32	2	\x32	AB	62	b	\x62	B
03		\x03	A	33	3	\x33	AB	63	c	\x63	B
04		\x04	A	34	4	\x34	AB	64	d	\x64	B
05		\x05	A	35	5	\x35	AB	65	e	\x65	B
06		\x06	A	36	6	\x36	AB	66	f	\x66	B
07		\x07	A	37	7	\x37	AB	67	g	\x67	B
08		\x08	A	38	8	\x38	AB	68	h	\x68	B
09		\x09	A	39	9	\x39	AB	69	i	\x69	B
0A	Not possible to describe in character notation.	\x0A	A	3A	:	\x3A	AB	6A	j	\x6A	B
0B		\x0B	A	3B	;	\x3B	AB	6B	k	\x6B	B
0C		\x0C	A	3C	<	\x3C	AB	6C	l	\x6C	B
0D		\x0D	A	3D	=	\x3D	AB	6D	m	\x6D	B
0E		\x0E	A	3E	>	\x3E	AB	6E	n	\x6E	B
0F		\x0F	A	3F	?	\x3F	AB	6F	o	\x6F	B
10		\x10	A	40	@	\x40	AB	70	p	\x70	B
11		\x11	A	41	A	\x41	AB	71	q	\x71	B
12		\x12	A	42	B	\x42	AB	72	r	\x72	B
13		\x13	A	43	C	\x43	AB	73	s	\x73	B
14		\x14	A	44	D	\x44	AB	74	t	\x74	B
15		\x15	A	45	E	\x45	AB	75	u	\x75	B
16		\x16	A	46	F	\x46	AB	76	v	\x76	B
17		\x17	A	47	G	\x47	AB	77	w	\x77	B
18		\x18	A	48	H	\x48	AB	78	x	\x78	B
19		\x19	A	49	I	\x49	AB	79	y	\x79	B
1A		\x1A	A	4A	J	\x4A	AB	7A	z	\x7A	B
1B		\x1B	A	4B	K	\x4B	AB	7B	{	\x7B	B
1C		\x1C	A	4C	L	\x4C	AB	7C			\x7C	B
1D		\x1D	A	4D	M	\x4D	AB	7D	}	\x7D	B
1E		\x1E	A	4E	N	\x4E	AB	7E	~	\x7E	B
1F		\x1F	A	4F	O	\x4F	AB	7F		\x7F	B
20	Space	\x20	AB	50	P	\x50	AB				
21	!	\x21	AB	51	Q	\x51	AB		Not possible to describe in character notation.		
22	"	\x22	AB	52	R	\x52	AB				
23	#	\x23	AB	53	S	\x53	AB				
24	$	\x24	AB	54	T	\x54	AB				
25	%	\x25	AB	55	U	\x55	AB				
26	&	\x26	AB	56	V	\x56	AB				
27	,	\x27	AB	57	W	\x57	AB				
28	(	\x28	AB	58	X	\x58	AB				
29	)	\x29	AB	59	Y	\x59	AB				
2A	*	\x2A	AB	5A	Z	\x5A	AB				
2B	+	\x2B	AB	5B	[	\x5B	AB				
2C	¥	\x2C	AB	5C	¥	\x5C	AB				
2D	-	\x2D	AB	5D	]	\x5D	AB				
2E	.	\x2E	AB	5E	^	\x5E	AB				
2F	/	\x2F	AB	5F	_	\x5F	AB				

- If Code Set C is selected, characters 0 to 9 can be used, and are encoded for every two digits. If the number of digits is odd, an error of (2) results. If a character other than 0 to 9 and a function are specified, shifting to other code set is performed. No automatic return takes place.
- If character A of the code set in the above shown table appears, the code-set character (or start character) of CODE A is automatically inserted. In the case of character B of the code set, the code-set character (or start character) of CODE B is automatically inserted. In the case, of character AB of the code set, shifting occurs only from Code Set C, since both characters are assigned each code set. However, if the start character is not determined yet, the start character of CODE B is inserted.

Print specifications:

The following tables show the print specifications applied if printing is performed vertically. ( ) shows the specification if printing is performed horizontally.

Table 2.95   For 80 mm paper width

Code	Print specification	
JAN	Number of printed digits	8 and 13 digits including C/D
	Print width	8 digits: 25.125 mm
		13 digits: 35.625 mm
	Printed data	Number, 0 to 9
	C/D	Not dispensable: modulo 10, automatic calculation
UPC-E	Number of printed digits	6 digits
	Print width	19.125 mm
	Printed data	Number, 0 to 9
	C/D	Not dispensable: modulo 10, automatic calculation
NW-7	Number of printed digits	3 to 23 (28) digits including start/stop codes
	Print width	9.25 to 69.25 (84.25) mm
	Printed data	Number, 0 to 9
		Start/Stop codes: A to D/a to d
		Symbols: -,$,:,/,.,+
	C/D	Not appended.
Code39	Number of printed digits	3 to 18 (22) digits including start/stop codes.
	Print width	11.125 to 69.25 (84.75) mm
	Printed data	Number, 0 to 9
		Start/Stop codes: *
		Symbols: -,.,$,/,+,%,space
		Alphabets: A to Z
	C/D	Optionally appended: Modulo 43, automatic calculation is possible.
ITF	Number of printed digits	Even number of 2 to 34 (44) digits including C/D.
		"0" is appended at the beginning if the data has an odd number of digits.
	Print width	6.125 to 70.125 (90.125) mm
	Printed data	Number, 0 to 9
	C/D	Optionally appended: Modulo 10, automatic calculation is possible.

Continue.

Code128	Number of printed digits	3 to 26 (46) digits including start code, C/D, and stop code.
	Print width	9.000 to 72.000 (127.000) mm
	Printed data	Digit, 0 to 9
		Alphabets: A to Z, a to z
		Symbols: space,!,",#,$,%,&,',(,),*,+,-,.,/,:,;,<,=,>,?,@, [,\,],^,_,`,{,|,},~
	C/D	Not dispensable: Modulo 103, automatic calculation is possible

Table 2.96　58 mm paper width

Code	Print specification	
JAN	Number of printed digits	8 and 13 digits
	Print width	8 digits: 19.125 mm
		13 digits: 35.625 mm
	Printed data	Digit, 0 to 9
	C/D	Not dispensable : modulo 10, automatic calculation.
UPC-E	Number of printed digits	6 digits
	Print width	19.125 mm
	Printed data	Digit, 0 to 9
	C/D	Not dispensable : modulo 10, automatic calculation.
NW-7	Number of printed digits	3 to 15 (28) digits including start/stop codes.
	Print width	9.25 to 45.25 (84.25) mm
	Printed data	Digit, 0 to 9
		Start/Stop code: A to D/a to d
		Symbols: -,$,:,/,.,+
	C/D	Not appended.
Code39	Number of printed digits	3 to 12 (22) digits including start/stop codes.
	Print width	11.125 to 46.00 (84.75) mm
	Printed data	Digit, 0 to 9
		Start/Stop codes
		Symbols: -,.,$,/,+,%,space
		Alphabets: A to Z
	C/D	Optionally appended: Modulo 43, automatic calculation is possible.
ITF	Number of printed digits	Even number of 2 to 22 (44) digits including C/D.
		"0" is appended at the beginning if the data has an odd number of digits.
	Print width	6.125 to 46.125 (90.125) mm
	Printed data	Digit, 0 to 9
	C/D	Optionally appended: Modulo 10, automatic calculation is possible.
Code128	Number of printed digits	3 to 17 (46) digits including start code, C/D, and stop code.
	Print width	9.000 to 47.000 (127.000) mm
	Printed data	Digit, 0 to 9
		Alphabets: A to Z, a to z
		Symbols: space,!,",#,$,%,&,',(,),*,+,-,.,/,:,;,<,=,>,?,@, [,\,],^,_,`,{,|,},~
	C/D	Not dispensable: Modulo 103, automatic calculation is possible.

Printing with Print System

Through the Printer Library of the Print System it is possible to use the GDI function of WindowsCE to create and print out the print data.

Configuration of the Print System:

The Print System configuration is shown below.

Figure 2.28

The application first creates (retrieve) the device context of the printer.

If the application starts (CpStartDoc) the print job, the spooler begins to create the spool file.

Create the print data with the GDI function for the device context of the printer.

If the application completes the print job, the spooler also completes the creation of spool file. At this point in time, print control from the application is terminated. (From the point in time spooling is completed, actual printing commences.)

The spooler will start printing after creation of the spool file has been completed.
(Transmission of the spool file to the specified printer.)

Hereafter, the language monitor monitors the printer.
(Displayed as an icon on the Taskbar.)

Printing process

Application uses the Printer Library of the Print System to create and print out the print data. Printing from an application means a process up to the point the spooler creates a spool file via the above described printer driver. The actual print job is where the spooler, after creating the spool data, sends the print data via the language monitor/port monitor to the printer.
If printing begins, the corresponding icon is displayed in the Task Tray as shown below. Click this icon to open the On-Printing dialog.

Task Tray (printing is now being performed)

Figure 2.29

On-Printing dialog
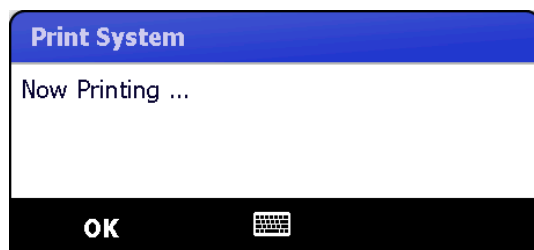
Figure 2.30

Close the dialog   : The corresponding icon appears in the Task Tray.

Monitoring the printer

With the Print System, the finish of the application-side print job is at the point in time the spool file of the print data is created. Subsequent monitoring of the printer is performed by the language monitor via the port monitor. If the language monitor detects a printer error, it displays a dialog box to post notice of the error.

Error display dialog
If an error occurs during printing, this error dialog is invoked.
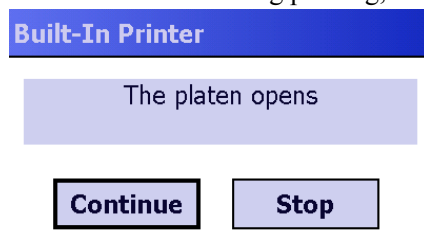
Figure 2.31

Continue button   : Continues the printing operation.
Stop button   : Stops the printing job.

Setting the printer

With the Print System it is possible to set up the printer while displaying the Printer Property dialog box.
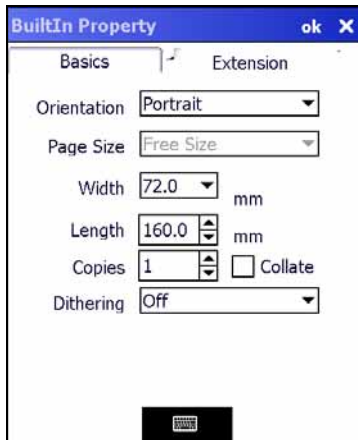
Figure 2.32

Orientation : Used to switch the orientation of the form between Portrait and Landscape.

Paper Size : Fixed to "Free size".

Width : Specify the paper width. Either directly enter the value or set up it through the spin control.

Length : Specify the paper length. Either directly enter the value or set up it through the spin control.

Copies : Specify the number of copies. Either directly enter the value or set up it through the spin control.

Collate : Specify whether the printing is performed per the specified number of sets (volumes). If this check box is selected, printing per the specified number of sets is performed.

Dithering : Used to set up the method for converting into a monochrome image, either Full binary or Pattern or Error diffusion.
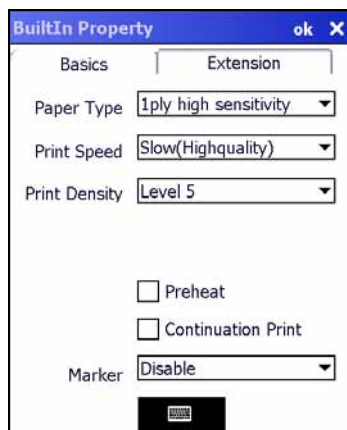
Figure 2.33

Paper Type no.	: Set up the paper model no., either 1-ply (high sensitivity) 1-ply (standard) 1-ply (for long-term storage) Label 1-ply (thin paper).	
Print Speed	: Set up the print speed, either Quick or Slow or (High-quality print) or Graphic.	
Print Density	: Set up the print density in the range of 1 to 9.	
Preheat	: Specify whether to pre-heat. If the check box is selected, pre-heating is conducted.	
Continuous Print	: Specify whether the printing operation continues after an error occurs. If the check box is selected, the function of continuous printing after an error occurs is enabled.	
Marker	: Specify whether the marker detecting function is enabled. Select between Disable, Detect the end point, and Detect the begin point.	

2.12.2 Detections

Marker Detection

This function detects a marker which is pre-printed on the back of the paper roll in order to align the print position. If no marker can be detected within 30 cm of a paper feed after this marker detecting function has been carried out, the marker detection error is output and the printer operation stops. To perform marker detection use the library function.

The marker width to detect differs depending on whether back barcode is enabled or disabled.
When back barcode is disabled: 5 mm
When back barcode is enabled: 10 mm

The following market detection modes can be specified using ESC commands.

Marker end detection	When marker detection is performed, the marker is detected when it has passed over the marker sensor
Marker beginning detection	When marker detection is performed, the marker is detected when it enters the area over the marker sensor

The marker detection mode can be set in the registry. When the printer opens, the value is acquired from the registry and acted on. The setting value can also be changed using an ESC command, but the change will not be saved in the registry.
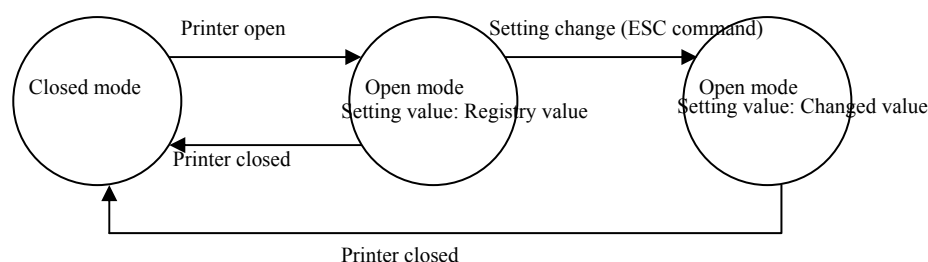
Notes:
- If an error (including a suspend process) occurs during detecting a marker, the marker detecting operation stops and an error is returned.
- The marker detecting operation must be carried out when data to be printed (ex. Right after opening the printer or right after all data are output for printing) do not exist in the buffer.
- When marker beginning detection is set, detection of markers (black) that are less than the marker width when marker detection is performed is stopped. Therefore, this cannot be used with paper that has black areas other than markers, such as paper with a back barcode. Only use this mode to adjust the print start position when using paper from a previous model that has a print start position different from the IT-9000.

Prior to producing your own formed papers that feature the marker detection, refer to Chapter 2.14.6 "Guide Line to Producing Formed Papers".

The function of the Printer Library relevant to the "Marker Detection" is as follows.
PRNCheckMarker : Feeds paper to marker position.

Platen Open Detection

The platen open status is automatically detected before printing or paper feed takes place. If the platen is open (platen open), the printing or paper feed operation is blocked.

Note:
If an attempt is due to print immediately after reset or opening/closing the platen, paper feed takes place for several tens of dots before printing starts. This is performed to offset the backlash (gap) between the printer motor gears produced by opening/closing the platen.

No Paper Detection

If there is no more paper being fed in during printing or paper feed, a "no paper" (paper end) is detected and the printer automatically stops. Also, printing does not take place if paper has not been loaded at the start of printing.

Supply Voltage (VDETP) Detection

During a printing operation, constant monitoring takes place to determine if there is a sufficient supply of voltage (VDETP) for printing. If VDETP is detected (i.e. the voltage goes below VDETP), the printer driver continues printing after restricting the voltage drop (due to printing) to a minimum by reducing the number of simultaneously colored (printed in black) dots during printing. However, if VDETP occurs when the number of simultaneously colored dots is at a minimum, an error (Voltage error: VDETP) is output and the printing operation stops.

Note:
If a voltage error is output, resume the printing after replacing the battery pack.

Head Temperature Detection

To obtain the best possible printing results the printer head should be thermally controlled according to the temperature that is sensed. In addition, in order to prevent a fire, etc., caused by an abnormal rise in temperature at the head, the head temperature is always monitored so that it does not exceed a specified temperature. If the head temperature exceeds the specified temperature, the energy supply to the head is forcibly stopped.

Hardware Error Detection

If it is detected that the printer fails and continues to output the strobe signal (i.e. applying energy to the paper), the printing operation stops.

Splash Cover Detection

Before printing, or before feeding paper, the splash cover status is detected automatically. Printing, or feeding paper, cannot be performed while the splash cover is closed.

Head temperature hold function

The function controls head temperature at the right temperature at all times, or for a set period. The head temperature hold function controls temperature as follows:

- If the head temperature has not reached the right temperature, it is raised until it reaches that temperature, after which further temperature increase is stopped.
- When the head temperature hold function is enabled, head temperature is still maintained after PRNClose is executed.

   APO operates according to settings after PRNClose.
- The head temperature hold time can be set to constant, or in units of five minutes up to one hour.

   The specified time is the time elapsed after the last time the head temperature hold command was sent. Printing time is included in the elapsed time, but suspended time is not.
- The head temperature will not rise while the I/OBOX AC adapter is connected (during charging).

   The battery does not charge while the head is being heated, so the head heating is stopped while the I/OBOX AC adapter is connected.

When the head temperature hold function is enabled, thermal energy is applied to the printer even when it is not printing, which negatively impacts print volume.

The back barcode reading function

This function can read a barcode on the back of the paper during printing, and acquire the decoded result. There are two specifications of barcode that can be read, as stated below.

Barcode configuration	Original	Original
Number of barcode digits	6 (e.g. 083092) First three digits 000~255 (e.g. 083) Last three digits 000~128 (e.g. 092)	15 digits 000000000000000~ 281474976710655 in base 10
Reading length	54 mm from the reading start specification	54 mm from the reading start specification

Barcode configuration (back of paper)

For 6 digits

Marker

Space between marker and barcode

Start bar

bit 7 (first 3 digits)

Data characters

First 3 digits (bit7~bit0)

Last 3 digits (bit6~bit0)

Separator (white)

bit 0 (first 3 digits)

bit 6 (last 3 digits)

Barcode area

bit 0 (last 3 digits)

Parity bar (even parity for black bars)

Stop bar

White space for

For 15 digits

Marker

Space between marker and barcode

Start bar

Separator (white)

bit16   bit40

Data characters

15 digits (bit47~bit0)

bit8   bit32

Barcode area

bit0   bit24

Parity bar (even parity for black bars)

Stop bar

White space for

-

- Marker area
  Markers are used to align the print start position. In the back barcode specification, the back barcode read start position is also aligned

- Space between marker and barcode
  This is a space (blank) to distinguish between the marker and the barcode.

- Barcode area
  The combination of black and white bars represents 6 or 15 digits. Barcodes consist of a start bar, data characters, parity bars and stop bar.

- Start bar
  This bar indicates the start of the barcode. It consists of one black and one white bar.

- Character bars
  Data characters are binarized and converted so that bit data "0" is represented by a black bar, and "1" by a white bar.
  One separator (white bar) is inserted for every four bits, to distinguish from markers.
  For six digits, the first three digits (0-255) are represented by 8 bits, and the last three (0~127) by 7 bits.
  For 15 digits (0-281474976710655), the barcode consists of two rows. The first 24 bits are on the right side, and the last 24 bits on the left side. For six digits, binarized data is converted so that bit data "0" is represented by a black bar, and "1" by a white bar, with a separator (white bar) inserted every four bits.

- Parity bar (even parity for black bars)
  This bar indicates even parity for the black bars from the start bar to the last data characters (the stop bar is not included). It consists of one black or one white bar.

- Stop bar
  This bar indicates the end of the barcode. It consists of one white and one black bar.

Example of a back barcode

- For 6 digits (083092) (083-> 0x53, 092-> 0x5C)

Start 0101 0011 1011 100 Stop

Parity
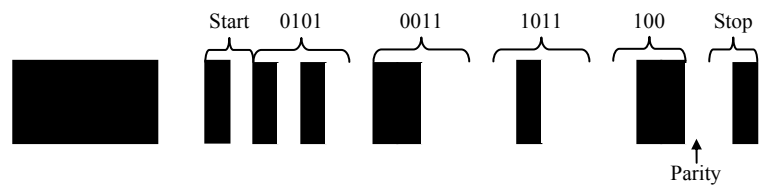
- For 15 digits (0101084670113732) (0101084670113732-> 0x5BEF9BDAB7C4)

Start 0101 1011 1110 1111 1001 1011 Stop

Parity

1101 1010 1011 0111 1100 0100 Stop

Parity
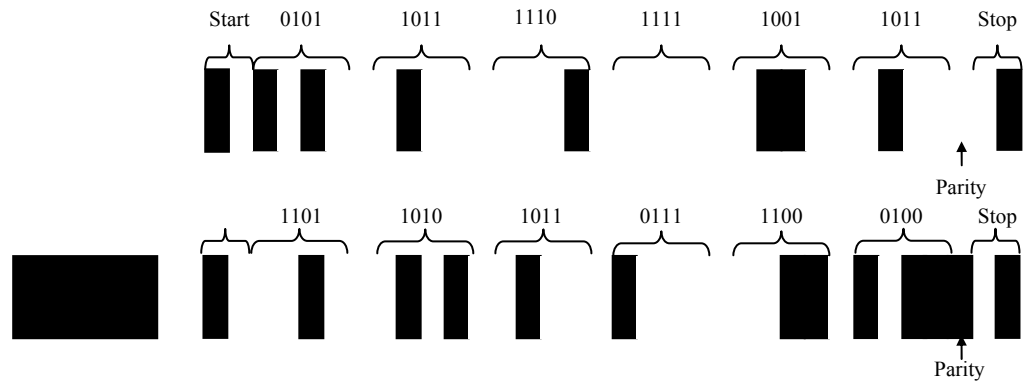
2.12.3 Error Control

If an error or Power OFF event occurs, it shall be handled according to the settings made with the ESC commands for specification of continuous printing after an error.

Table 2.97

Cause of error	Continuous printing after error: Enabled		Continuous printing after error: Disabled	
	Print data	Operation after resetting the error	Print data	Operation after resetting the error
Power OFF/VDET2	Retained	Printing continues (Note 1)	Cleared (Note 5)	Stop
VDETP	Retained	Printing continues	Retained	Printing continues. (Notes 2 and 3)
No paper	Retained	Printing continues	Cleared	Stop
Platen open	Cleared (if it occurs during printing.)	Stop	Cleared (if it occurs during printing.)	Stop
Head temperature	Retained	Printing continues	Retained	Printing continues. (Note 2)
Marker detection (Note 4)	--	Stop	--	Stop
Hardware error	Cleared	Stop	Cleared	Stop
Splash cover closed	Hold	Continue printing	Hold	Continue printing (Note 2)

Notes:

7. The instantly stops printing of the dot line currently printed and resets the error that occurs, and then resumes printing from the dot line at which the printing was stopped. As a result, a ± 1 dot-line of deviation can occur.

8. It is difficult to avoid an error caused by VDETP or the head temperature through user operation. Thus, this system always enables continuous printing after an error, irrespective of whether it is explicitly specified or not. In order to forcibly discontinue printing after an error clear the print data by sending the ESC command of "CAN" after the error has occurred.

9. A VDETP error that has occurred can be reset by battery pack replacement (Suspend/Resume). However, even after the battery voltage is recovered through charging the battery pack, always turn on and off the power.

10. For an error caused by the detected marker, the printing operation stops and an error is returned, irrespective of whether "Continuous printing after error" is specified.

11. After VDETP or Head temperature error has occurred, print data is retained until a next print request (text print, image print, etc.) is made even if power OFF or VDET2 occurs.

Priority of Errors

From this printer, notice of errors is posted according to the following priority.

Table 2.98

Priority	Error
1	Power OFF/VDET2 occurrence
2	Hardware error
3	Platen-open error
4	No paper error
5	Splash cover closed
6	VDETP occurrence
7	Head temperature error

Abnormal Head Temperature

The head temperature is always monitored so that an abnormal rise in the head temperature does not cause a malfunction, etc. If the head temperature rises abnormally, the power to the head is instantly stopped and the following message appears.

Message   "Because the printer head was turned off, please reset before printing".

2.12.4 Registry Information

For the printer various setup parameters are available. Among them, the settings in the table below are stored in the registry. After a reset is performed on the terminal, the stored settings in the registry remain effect unless they are intentionally modified. The registry key is as follows:
HKEY_LOCAL_MACHINE\DRIVERS\BUILDIN\PRNDRV

Table 2.99

Parameter		Registry key value
Paper setting	Specifying the paper type	PAPER_TYPE
	Specifying the paper width	PAPER_WIDTH
Print quality setting	Specifying the print density	DEPTH_OF_COLOR
	Specifying the print speed	PRINT_SPEED
Function setting	Specifying the pre-heating	PREHEAT
	Specifying continuous printing after error	PRINT_CONTINUATION
	Marker detection mode	MARKER_MODE
	Feed distance for beginning detection	FEED_FROM_BEGINPOINT

2.12.5 ESC Commands

The following table lists the ESC commands available to control the printer.

Table 2.100   List of the ESC commands

Command	Description	Default
CR, LF, FF	Print and paper feed	--
BS	Deleting one character	--
CAN	Clearing the buffer	--
ESC B n1 n2	Feeding paper for n (mm) length	--
ESC b n1 n2	Feeding paper for n (dot) length	--
ESC r n	Specifying the right margin	00h
ESC s n	Specifying the left margin	00h
ESC A n	Specifying the spacing between lines	08h
ESC W n	Specifying the spacing between characters	00h
ESC J n	Specifying the automatic line feed	01h (valid)
ESC Y n	Selecting the input character code	00h (Unicode)
ESC C n	Specifying the Kanji conversion	00h (invalid)
ESC u n	Selecting the international character set	00h (America)
ESC t n	Selecting the character code table	00h (Expanded graphic)
ESC F n	Specifying the character font	02h (16-dot font)
ESC S n1 n2	Specifying the character size	n1= 00h (x1) n2 = 00h (x1)
ESC O n	Enabling/disabling character decoration	00h (disable)
ESC L n	Enabling/disabling character rotation	00h (disable)
ESC m n Data	Defining (registering) the user-defined character	--
ESC K n1 n2 Data	Defining (registering) the stamp	White stamp of 96 dots in both vertical and horizontal sizes.
ESC G	Printing the stamp	--
ESC Q n	Composing the image data	00h (disable)
ESC I n	Specifying the bit image size	00h (x1)
ESC V n	Specifying the print speed	01h (Low speed (high quality))
ESC D n	Specifying the print density	05h (standard)
ESC P n	Specifying the paper type	00h (F-220VP0)
ESC p n	Specifying the head temperature holding function.	00h (invalid) 01h to 0Ch (specifying time: in unit 5 minutes) FFh (valid always)
ESC H n	Specifying the pre-heating	01h (invalid)
ESC T n	Specifying the automatic loading	00h (invalid)
ESC R n	Specifying the continuous printing after error	00h (invalid)
ESC M	Marker detection	--
ESC v n1 n2	Specifying the marker detection mode	n1=00h (end detection) n2=00h (0mm)
ESC E	Discharging the unprinted data (continuous printing)	--
ESC h n	Specifying the bar code height	12 (mm)
ESC c n	Specifying the bar code C/D	01h (append)

Continue.

ESC f n	Specifying printing bar code data	01h (8 x16-dot font)
ESC e n	Specifying the left margin for bar code printing	00h
ESC d n	Specifying the orientation of bar code printing	00h (vertical)
ESC g n1 n2 Data	Printing bar code	--
ESC Z n	Initialization	--

ESC f n	Specifying printing bar code data	01h (8 x16-dot font)
ESC e n	Specifying the left margin for bar code printing	00h

2.12.6 Guide Line to Producing Formed Paper

This chapter describes a guide line you must care when you produce your own formed papers.
The printer integrated in the terminal generates a marginal error on the printing position on paper.
The following explains a sample of formed paper.

While printing on a long formed paper, marginal error is accumulated. This deteriorates the printing accuracy. To avoid the accumulation, it is recommended that multiple markers are located at different locations in mid-course on the formed paper.

The below sample assumes that the distance from the marker to the print start position is A mm, marginal error is ±2 mm and the height of character is 4 mm.

Unit: mm
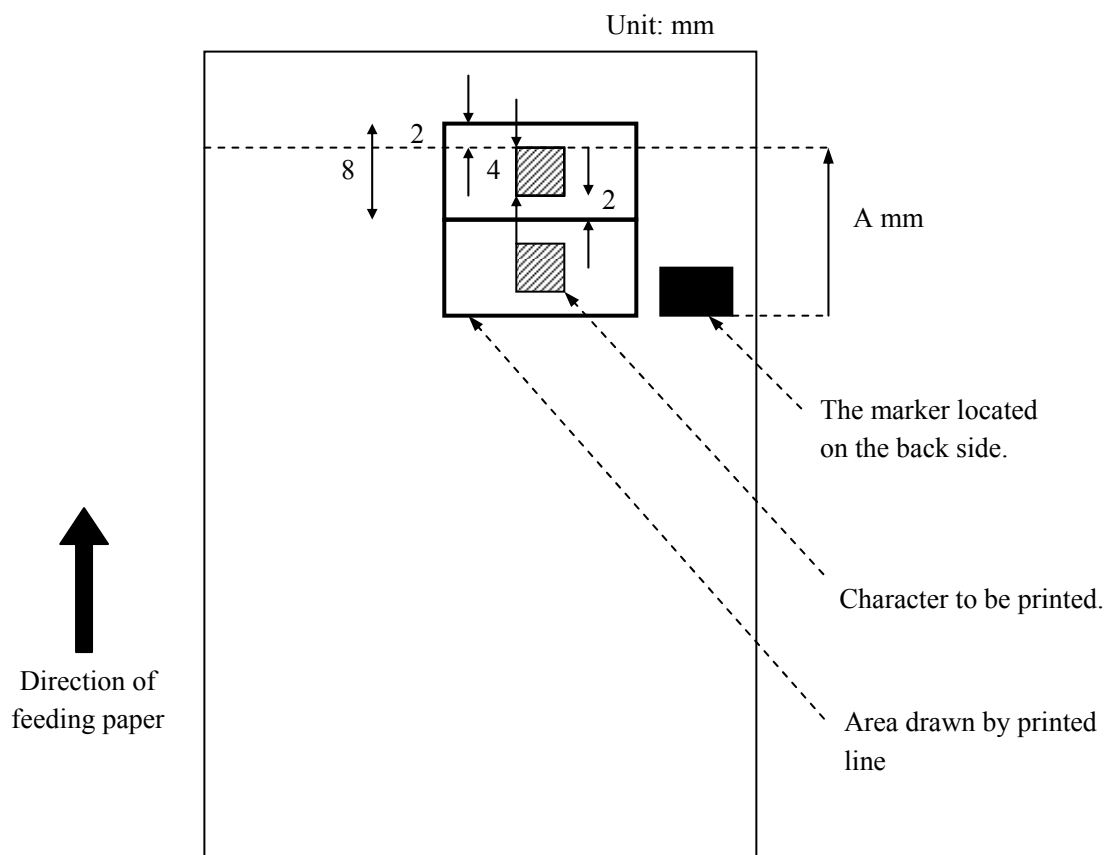
Above drawing is viewed from the front surface of the paper

Figure 2.34

2.13 Power Control

This chapter describes about detailed specifications of the power controls.

2.13.1 Monitoring Low Voltage

Four levels of the low voltage monitor control are provided for the terminal.

Table 2.101

	Description	Action	Next Startup
VDET1	Warning against low voltage of the battery pack	Issues warning message for low voltage of the battery pack.	-
VDET2	Turning off the power due to low voltage of the battery pack	Turns off the power.	Resume (with warning at time of startup)
VDET3	Emergency turning off the power due to low voltage of the battery pack	Forces the terminal to turn off the power.	Warm boot (with warning at time of startup)
VDETCF	Turning off the power due to low voltage of card	Turns off the power.	Resume (with warning at time of startup)

Battery Pack

The following shows statuses and levels available for the battery pack.
Normally the battery status is checked once every five seconds. Taking last immediate ten data of the power voltage from AD converter, its average is calculated to classify the status into three levels, either "Almost exhausted (10% of the capacity or less)", "Low (30% of the capacity or less)", "O.K. (30 % of the capacity or more)". When VDET1 occurs, the level is at 10% of the capacity.

Table 2.102

Status/Level		Notation	Description
Status	External	External power	Power via AC Adaptor is being supplied, and charging the battery pack is complete.
	Recharge	Recharging	Power via AC Adaptor is being supplied, and charging the battery pack continues.
	Normal	Main battery	Operating power by the battery pack is being supplied.
Level	1	O.K.	The battery pack has been fully charged or has a sufficient capacity.
	2	Low	The battery voltage level is at 30% or less.
	3	Almost exhausted	The battery voltage level is at 10% or less.

Memory Backup Battery

The following shows levels available for the memory backup battery.
The terminal's system checks the status of the backup battery every five minutes. Since power source of charging the memory backup battery is supplied by the battery pack, charging it may not be carried out sufficiently if the battery pack has not been accommodated for a long period or is not being fully charged. In other words, the memory backup battery will be normally charged if the battery pack has a sufficient level of battery capacity. Prior to operating the terminal, be sure that the memory backup battery is charged fully; otherwise the RAM content may not be held when the battery pack is demounted.

Table 2.103

Level	Notation	Description
1	O.K.	The memory backup battery has been fully charged or has a sufficient capacity.
2	Almost exhausted	The level of the memory backup battery capacity is at 10% or less.

User Notification Methods

The terminal's system issues a WM_POWERBROADCAST message when the battery pack or memory backup battery runs down into "Almost exhausted" state. Detail of the message is as follows:

Table 2.104

Battery	Message	wParam	lParam	Interval of notification
Battery Pack	WM_POWERBROADCAST	PBT_APMBATTERYLOW	0	5 seconds
Memory backup Battery	WM_POWERBROADCAST	PBT_APMOEMEVENT	SUBBATTERYLOW	5 minutes

```
#define WM_POWERBROADCAST    0x0218
#define PBT_APMBATTERYLOW    0x0009
#define PBT_APMOEMEVENT      0x000B
```

When the status of the memory backup battery is detected, the following value is set in the *lParam* parameter.

```
#define SUBBATTERYLOW        0x200
```

The status of both battery pack and memory backup battery can be monitored with Microsoft's **GetSystemStatusEx2() API** function in your application to retrieve the status values described in the table.

Table 2.105

Member	Description	Returned Value
ACLineStatus	Retrieves the status of AC power.	AC_LINE_OFFLINE : AC power is off. AC_LINE_ONLINE : AC power is on.
BatteryFlag	Retrieves the status of battery pack.	BATTERY_FLAG_HIGH : OK BATTERY_FLAG_LOW : Low BATTERY_FLAG_CRITICAL : Almost exhausted. BATTERY_FLAG_CHARGING : Under charging
BatteryLifePercent	Retrieves the remaining capacity of battery pack every 10% level.	In the range of 10 to 100%
BackupBatteryFlag	Retrieves the status of memory backup battery.	BATTERY_FLAG_HIGH : OK BATTERY_FLAG_LOW : Almost exhausted
BatteryChemistry	Retrieves the type of the operating battery.	BATTERY_CHEMISTRY_LION : Battery pack BATTERY_CHEMISTRY_ALKALINE : Dry-cell battery

Note:
IT-9000 does not support power source from dry-cell battery.

2.13.2 Power ON Factors

The following is the power ON factors. These factors can be set enabled or disabled using the System Library.

Power ON Factors

- The Power key is pressed while the power is off.
- A time period set for the Alarm function elapsed.
- The terminal is mounted on cradle while the power is being supplied by AC Adaptor via the cradle.
- Trigger key is pressed.
- Reset switch on the back of the terminal is pressed.

The functions of the System Library relevant to the "Power ON Factors" are as follows.
SysSetBootup : Sets up "Enable" or "Disable" for turning on the power.
SysGetBootup : Retrieves "Enabled" or "Disable" status for turning on the power.

Power ON Disable Factors

Factors that do not allow turning on the power are as follows.
- When the battery pack's voltage level is not sufficient enough to start up the terminal (VDET2 level or less).
- The battery cover lock switch (at the battery compartment) is open.

2.13.3 Power OFF Factors

The following is the power OFF factors.

- The Power key is pressed while the power is on.
- Neither key input, disk access, nor communication is performed within a preset time period.
- Output voltage from the battery pack is low (VDET2, VDET3) (see note below).
- The battery cover lock switch is open.
- Internal temperature in the terminal exceeds the limit set by the system (see note below).

Note:
The warning message appears a next time when the power is turned on.

Power OFF Time

When either VDET2, BCVR, VDETCF, or VDET3 occurs, the power is turned off after the respective time periods elapse.

Table 2.106

VDET2	Turning off (resume OFF) the power after 200 milliseconds.
BCVR	
VDETCF	
VDET3	Forced to turn off the power after 200 microseconds.
	When the power is turned on next time, VDET3 is reset.

2.13.4 Control on Power Key

Time Period after Pressing the Power Key

It takes approximately one second for the system to recognize turning on or turning off the power after the Power key is pressed down.

Disable Power Key after Turning On the Power

After turning on the power, the Power key is set disabled for a certain period of time. This prevents turning off the power while various drivers are being loaded. This time period can be set with the System Library.

The functions of the System Library relevant to the "Disable Power Key after Turning on the Power" are as follows.

SysSetOffMaskTime	: Sets up a period of time for disabling turning off the power.
SysGetOffMaskTime	: Retrieves time period set for disabling turning off the power.

Disable Power Key after FlashDisk Is Accessed

After the FlashDisk is accessed, the Power key will be set disabled for a certain period of time. This prevents turning off the power while the FlashDisk is being accessed. This time period can be set with the System Library.

The functions of the System Library relevant to the "Disable Power Key after FlashDisk Is Accessed" are as follows.

SysSetStorageOffMaskTime	: Sets up a period of time for disabling turning off the power after the use of storage.
SysGetStorageOffMaskTime	: Retrieves time period set for disabling turning off the power after the use of storage.

Disable Turning Off the Power

It is possible to disable turning off the power with the Power key using the System Library. This feature can be applicable to the cases below.

- Need to disable turning off the power with the Power key for a certain period of time.
- If application must be closed before the system turns off the power.

If the Power key is pressed down while the Power key is set disabled, the system broadcasts a message, WM_POWERBROADCAST (PBT_APMSUSPEND), to application software without turning off the power. The message is issued only once when the Power key is pressed for the first time after the "Disable Turning Off the Power" has been set enabled.

The functions of the System Library relevant to the "Disable Turning Off the Power" are as follows.

SysDisablePowerOff	: Sets up "Disable" for turning off the power on the terminal.
SysEnablePowerOff	: Sets up "Enable" or "Disable" for turning off the power on the terminal.
SysGetPowerOff	: Retrieves "Enable" or "Disable" status for turning off the power on the terminal.

2.13.5 Power Saving

Idle

The power is saved by putting the CPU into **idle state** when event standby status is detected by either the terminal or application running on the terminal. The peripheral devices are in operating state while the CPU is in the idle state.

Auto Power OFF (APO)

The power is automatically turned off ("APO") if no key input, no disk access, or no communication is made during a preset time period. Setting the APO function enabled or disabled, and a time period to activate the function can be performed using the System Library.

The functions of the System Library relevant to the Auto Power OFF (APO) are as follows.

SysDisableAPO : Sets up "Disable" for turning off the power automatically.
SysEnableAPO : Sets up "Enable" for turning off the power automatically.
SysGetAPO : Retrieves "Enable" or "Disable" status for turning off the power automatically.

Dimming and ABO (Auto Backlight OFF)

The backlight is automatically dimmed or turned off if no key input, no disk access, no communication, and etc., is made during the preset time period. Setting a time period before starting dimming or turning off the backlight (Auto Backlight OFF), and "Enable" or "Disable" on the dimming and the Auto Backlight OFF functions can be set at the Control Panel.

CPU Clock Frequency Control

The CPU clock frequency is changed to one of the frequencies described in the following table depending on the CPU load or user designation. It can be changed at the Control Panel or using the System Library. The default is "AUTO". Note however that the CPU frequency is not changed to 13 MHz in the Auto mode if WLAN operation has been set effect.

Table 2.107

Mode	Frequency
POWERSAVE	208 MHz
NORMAL	312 MHz
TURBO	624 MHz
AUTO	Automatically changes frequency to 104, 208, 312, 624, or 60 MHz depending on the CPU load.

The functions of the System Library relevant to the "CPU Clock Frequency Control" are as follows.

SysSetCPUMode : Sets up the CPU frequency control.
SysGetCPUMode : Retrieves the status of the CPU frequency control.
SysSetDefaultCPUMode : Returns the CPU speed setting to the factory default.

Virtual Power OFF/WLAN Standby

This is standby mode for WLAN operation. The System Library is used in application to turn off the LCD, keys and set the CPU frequency to "POWERSAVE" mode to save the power. Other peripheral devices are in operating state.

Table 2.108

Display	OFF
KEY	Lock
APO	Prohibit
Turning off the power with the Power key	Prohibit
CPU clock frequency	POWERSAVE

2.13.6 CPU Power Mode

The following shows the power modes operable on the terminal.

Table 2.109

Mode		Description
Discharge		State in that the battery pack and the super capacity have been discharged. Neither content in the RAM nor the RTC is backed up.
RTC backup		State in that only the RTC is being backed up. The content in the RAM is not backed up.
SLEEP mode		State in that the power on the terminal is turned off, and peripheral devices are also turned off. The RTC and the content in the RAM are backed up.
RUN mode		State in that the terminal is running or application is running on the terminal.
	POWERSAVE	The CPU is running at 208 MHz.
	NORMAL	The CPU is running at 312 MHz.
	TURBO	The CPU is running at 628 MHz.
	AUTO	The CPU is running at either 104, 208, 312, 624, or 60 MHz depending on the CPU load.
IDLE mode		State in that the terminal or application is waiting for an event to occur.
	DeepIdle	If the CPU clock frequency has been set to "AUTO" mode, and the backlight is turned off, the CPU runs at 13MHz ("DeepIdle" mode). Note however that the CPU will be in ordinary "Idle" state, not DeepIdle mode, if periodical accesses are made to the integrated WLAN module.
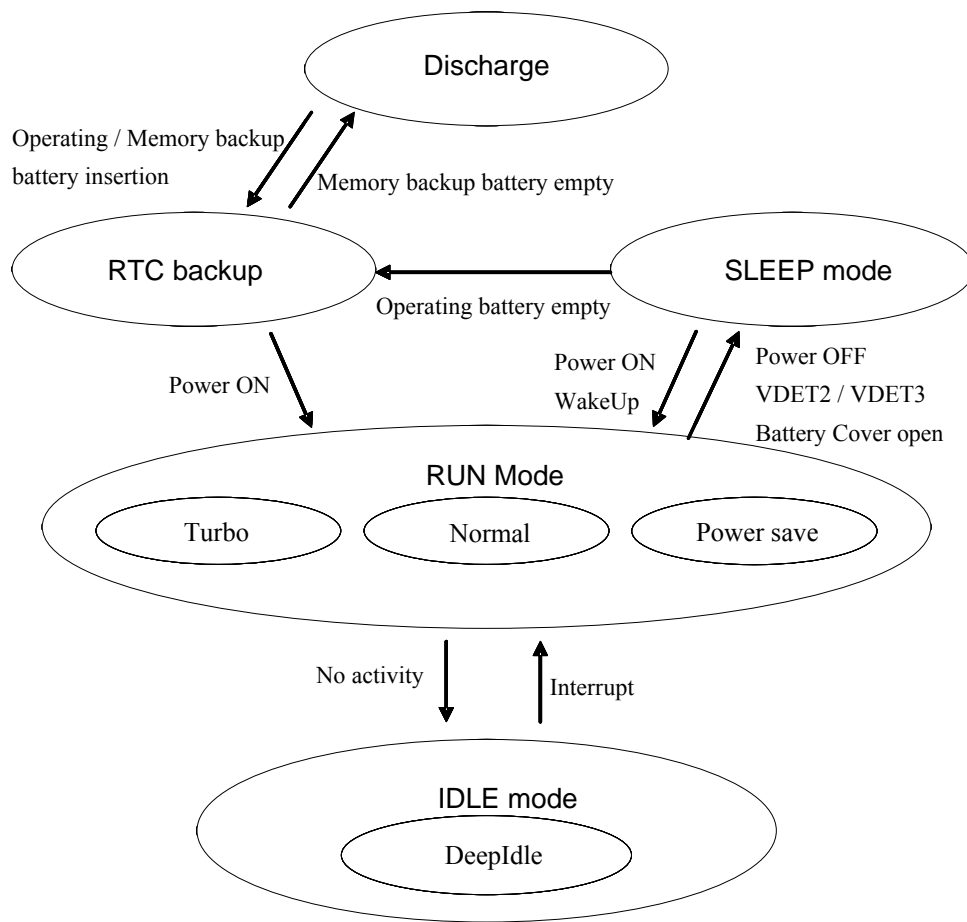
Figure 2-35

2.13.7 Virtual OFF by Application

The Virtual OFF is a function and its main object is to save power. Internally, the terminal is running normally but it seems to be with the power being turned off – unable to display and input a key. This function is mainly used to provide the terminal user with fast resume from standby state in WLAN communication.

Virtual OFF State Transition

The state transition diagram of Virtual OFF is below. The system has a mode named Virtual OFF and the state transits ON State and OFF State in the mode. The transition is triggered by the message issued by pressing the Power key.
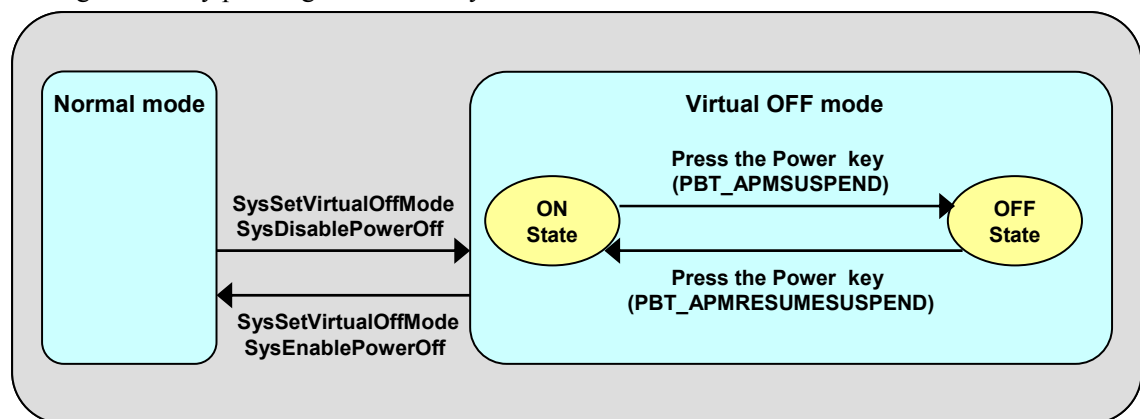
Figure 2-36

How to Set Virtual OFF Mode in Application

In order to set the Virtual OFF mode, call **SysSetVirtualOffMode** and **SysDisablePowerOff** functions of the System Library. In this mode, the Power Management alternately issues the following messages every time the Power key is pressed.

1. When the Power key is pressed to turn off the power:
   WM_POWERBROADCAST (PBT_APMSUSPEND)

2. When the Power key is pressed to turn on the power:
   WM_POWERBROADCAST (PBT_APMRESUMESUSPEND)

In the diagram in Figure 2.14, the application receives PBT_APMSUSPEND message at the first press of the Power key and then changes the state to OFF State in the Virtual mode. And then the application receives PBT_APMRESUMESUSPEND message and returns to ON State.
The application undertakes the transition to OFF State in the Virtual OFF mode. For example, the application disables display, key input, and etc. and turns off the power to devices in idle.
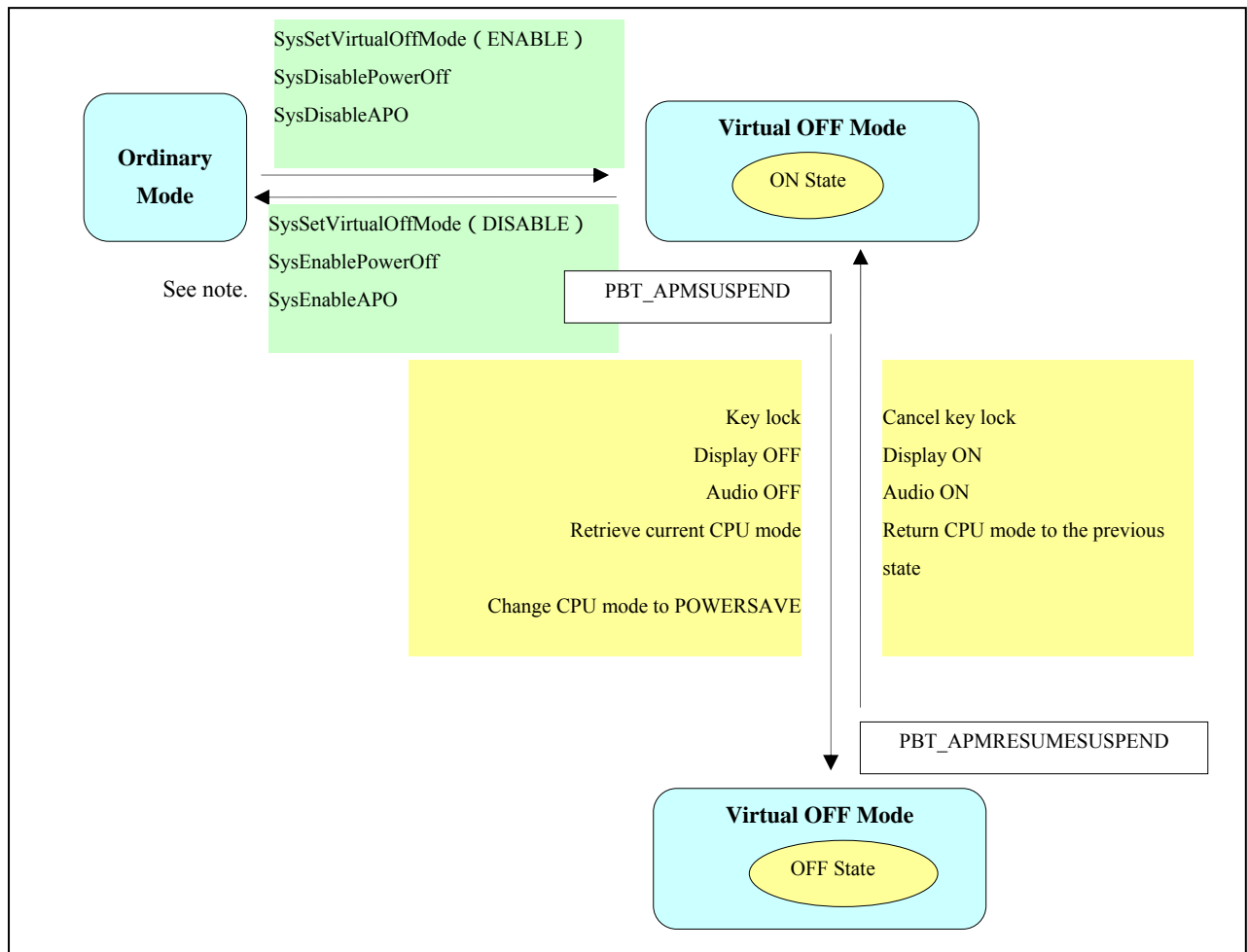
Figure 2-37

Notes:
- If the application receives the low battery warning message (PBT_APMBATTERYLOW), the application should reset the Virtual OFF mode and warn the user of low battery. If the user continues to operate the terminal ignoring resetting the Virtual OFF mode, turning off the power will occur (ordinal process to turn off the power) due to low voltage of the battery. This causes a confusion and makes the user unable to judge whether the terminal cannot resume from the Virtual OFF mode or troublesome caused by the battery ran out.
- During the Virtual OFF mode, if low battery or turning off the power by opening the battery cover lock switch occurs, there will be discrepancy between the expected condition the application assumes at the next time of starting up and actual condition. For turning off the power in ordinary process, the discrepancy is caused by two kinds of setting, one should be reset and the other to be saved. These settings must be set to ON state again in the Virtual OFF mode when the application receives the Power On message (PBT_APMRESUMESU|SPEND).

The functions of the System Library relevant to the "Virtual Off" are as follows.

SysDisablePowerOff : Set up "Disable" for turning off the power on the terminal.

SysSetVirtualOffMode : Sets up "Enable" or "Disable" for virtual turning off the power.

SysSetVirtualOffModeEx : Sets up "Enable" or "Disable" for virtual turning off for panel, screen, key operations, prohibition on APO, prohibition on turning off the power, and setting CPU speed.

SysGetVirtualOffMode : Retrieves "Enable" or "Disable" status for virtual turning off the power.

2.13.8 Virtual OFF by System

The virtual off function by system is not supported by the terminal.

2.13.9 Charging/Supplying the Power

The optional Dual Battery Charger (HA-D32DCHG) can be used to charge battery packs (two at a time). Mounting the terminal on USB Cradle (HA-H60IO), Cradle-type Battery Charger (HA-H30CHG), or Ethernet Cradle (HA-H62IO) allows charging the battery pack while it is installed in the terminal and supplying the power to the terminal.

2.13.10 Temperature Control

If temperature rise is detected in the terminal when running at the highest clock frequency (under such the condition that the CPU speed at "TURBO", the integrated WLAN module in active mode, etc.), a warning message (see Figure 2.16) appears and the power is turned off to protect the integrated devices in the terminal.
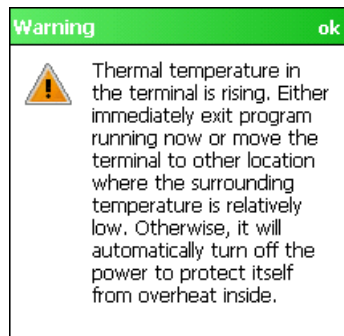
Figure 2-38

Either turn off the power and leave the terminal unused for a while or move the terminal to a location where the surrounding air temperature is cooler.
If the power is turned off due to the temperature limit, a warning message (see Figure 2.17) appears when the power is turned on a next time.
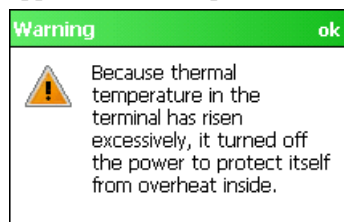
Figure 2-39

2.14 Security

This chapter describes about detailed specifications of the security.

2.14.1 Setting Password for Terminal

This is the password setting implemented in the terminal. Your password can be set at the Control Panel. Click the **Lock** icon to initiate the **Password Settings** screen, and then enter your password in each field.

2.14.2 Setting Encryption on SD Card

This function encrypts file in SD card which is integrated in the terminal (Windows Mobile device) so that the file in the SD card cannot be read by other Windows Mobile device.

2.14.3 Setting Individual ID

Individual ID is written into a predetermined area in the FlashDisk in the factory. Distributor code (a code used to protect distributor developed software from illegal copying by an unauthorized party) is saved in other area different from the individual ID. The individual ID incorporates the product code and serial number etc. and always becomes a unique code different from other units of the IT-9000 series. The System Library can be used to read the individual ID set on each unit of the terminal.

The function of the System Library relevant to the "Setting Individual ID" is as follows.
　SysGetDeviceIDCode 　: 　Retrieves Device ID.

2.14.4 Setting Distributor ID

The individual ID and distributor ID can be used by the distributor and user to prevent illegal use of applications by an unauthorized party at a time of installing or carrying out the illegally copied applications by checking these preset codes. The distributor code is saved in the FlashDisk area, and read using the System Library.
Set up your individual ID with the ID setting tool that can be downloaded from the Casio web site.

The function of the System Library relevant to the "Setting Distributor ID" is as follows.
　SysGetUserIDCode 　: 　Retrieves User ID.

3. Control Panel Applets

The Control Panel applets initiated by navigating to **Start** **Settings** are programs that display the content of the various parameters for the terminal itself and to change the settings.

The Control Panel has three tabs. The applets in each tab are listed in the following tables. See Tables 3.1 to 3.3.

Table 3.1   Settings

Name	Description	CASIO	MS
Bluetooh	Bluetooh	--	Yes
Clock & Alarms	Changes the date, time, and alarm settings.	--	Yes
Microsoft My Phone	Microsoft My Phone	--	Yes
Lock	Changes owner password and security options.	--	Yes
Power	Changes the power management options.	--	Yes
Sounds & Notifications	Sets up type and its sound volume.	--	Yes
Today	Customizes the Today screen.	--	Yes

Table 3.2   Personal Tab

Name	Description	CASIO	MS
Buttons	Changes the parameters concerned with operations by the keyboard.	--	Yes
Input	Changes the text input method.	--	Yes
Owner Information	Changes owner's personal profile.	--	Yes
Pnone	Phone sett.ing	--	Yes

Table 3.3　System Tab

Name	Description	CASIO	MS
About	Displays system information.	--	Yes
Backlight	Changes the backlight brightness.	--	Yes
Buzzer	Sets up buzzer sound volume.	Yes	--
Certificates	Displays the terminal's digital certificate.	--	Yes
Certificates	Certificates Install	--	Yes
CPU Speed	Sets up the CPU's clock frequency.	Yes	--
Customer Feedback	Enables Customer Feedback possible.	--	Yes
Encryption	Enables the terminal to encrypt files in storage card.	--	Yes
Error Reporting	Enables the terminal to issue Error Report.	--	Yes
External GPS	Sets up the GPS device.	--	Yes
Imager Setting	Changes the Imager settings.	--	--
Managed Programs	Displays the information about installed programs.	--	Yes
Memory	Displays the usage of main memory and storage card memory.	--	Yes
PrinterSetup	Change the Printer settings.	Yes	--
Regional Settings	Changes display methods of numeric value, currency, date and time.	--	Yes
Remove Programs	Deletes application program installed in the terminal.	--	Yes
Scanner Setting	Changes Laser Scanner settings.	--	--
Screen	Switches the screen orientation. Realigns the touch screen. Increases or decreases the size of text on the screen.	--	Yes
TStrage Manager	Storage Manager	--	Yes
Task Manager	Switches to a running program. End a running program.	--	Yes
USB Connection	Checks USB connection status.	Yes	--
Version Info	Displays the terminal version information.	Yes	--
Vibrator	Vibrator Property	Yes	--

Table 3.4   Connections Tab

	Name	Description	CASIO	MS
	Beam	Enables the terminal to receive all incoming beams.	--	Yes
	Connections	Connection Manager	--	Yes
	Domain Enroll	Controls the terminal to your network.	--	Yes
	Network Cards	Configures network adapters.	--	Yes
	USB to PC	Enables advanced network functionality.	--	Yes
	WAN Settings	Sets up the power for WAN and the parameters required for WAN configuration.	Yes	--
	Wireless Manager	Enables or disables network devices.	--	Yes
	WLAN Power	Sets up the powers for WLAN.	Yes	--
	WLAN Settings	Sets up the parameters required for WLAN configuration.	Yes	--

3.1 Clock & Alarms

This applet is for setting date, time and time zone.

Time Tab

This tab is for setting time zone, time and date.

Figure 3-1

Alarms Tab

This tab is for setting alarms.

Figure 3-2

To set alarms, follow the steps below.

1. Tap **< Description >** and enter a name for the alarm.
2. Tap a day of the week for the alarm. You can select multiple days by tapping each desired day of the week.
3. Tap time to open a clock and set time for the alarm.
4. Tap 🔔 to specify a type of alarm you want.

More Tab

This tab is for setting options.
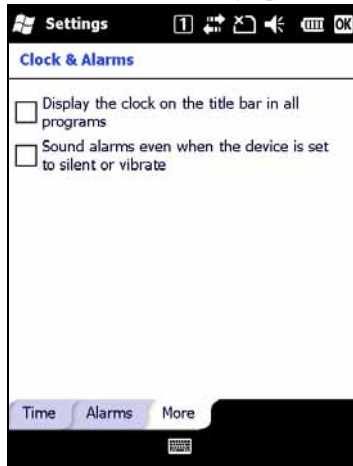
Figure 3-3

To display the clock in the title bar, select **Display the clock on the title bar in all programs** checkbox.

3.2 Lock

This applet is to set up a password that is used to start up the terminal.

Password Tab

Figure 3-4

Prompt if device unused for

Check the checkbox if password input is required every time the terminal is turned off and then turned on during the time period selected in the pull-down menu. For example, selecting "0" in the pull-down menu makes the password enter screen pop up every time when the terminal is turned on asking the user to enter a password before starting any operation. Or, removing the check causes the password enter screen not to pop up irrespective of time period selected in the pull-down menu.

Password type

Select one of the password types in the pull-down menu you would like to use.
- **Simple PIN** indicates a numeric password.
- **Strong alphanumeric** indicates a password that uses uppercase and lowercase letters, numbers, and symbols such as punctuation.

Password

This field is for entering your own password.

Confirm

This field is for entering the same password again entered in the **Password** field for confirmation purpose.

Hint Tab

This tab is for setting up a password hint.

Figure 3-5

To help you recall your own password, enter a word or phrase that reminds you of the password.

Display Tab

Changing the unlock display will require your device to restart..

Figure 3-9

3.3 Power

This applet is used to view the status of batteries and set power management options.

Battery Tab
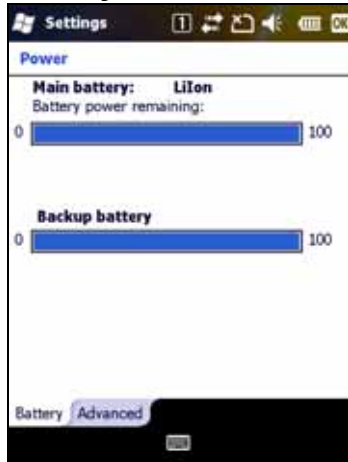
Figure 3-6

This tab provides information about status of operation battery (lithium-ion battery pack) and backup battery.

Advanced Tab

Figure 3-7

To conserve battery power, select the checkbox for condition that you want the terminal to turn off its power automatically if no access to the terminal is made during the selected time period in the pull-down menu located on the right side of the checkbox.

3.4   Sounds & Notifications

This applet is to set up event sounds and notification options.

Sounds Tab

This tab is to set up "Enable" or "Disable" for sound types of each event listed in the figure below.
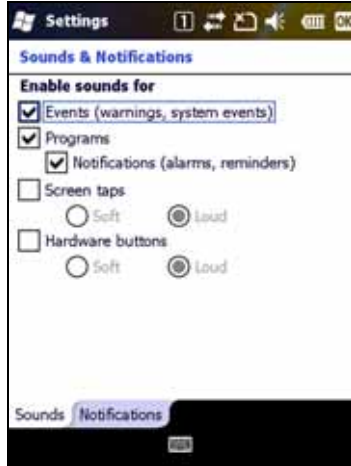
Figure 3-8

Check the checkbox of each event you wish to set up sound.

Notifications Tab

Figure 3-9

In the **Event** pull-down menu, tap an event name and then set up the relevant options for how you want to be notified. The options include special sound, message, and flashing light. Even if you disable all the options, you can still be notified by the icon of event.

3.5 Today

This applet is used for customizing the Today screen.

Appearance Tab
This tab is used for changing the appearance of the Today screen.

Figure 3-10

To change the current theme, highlight a new theme in the **Select a theme for your device** menu.

To change the background image in the Today screen, follow the steps below.
1. Select the **Use this picture as the background** checkbox and tap **Browse** button to make a list of your picture files appear.
2. In **Folder**, select the folder that contains the picture you want to use.
3. In **Type**, select the file type of the picture.
4. Tap the file name of the picture you want to use.

Items Tab

This tab is used for changing the items that appear in the Today screen.
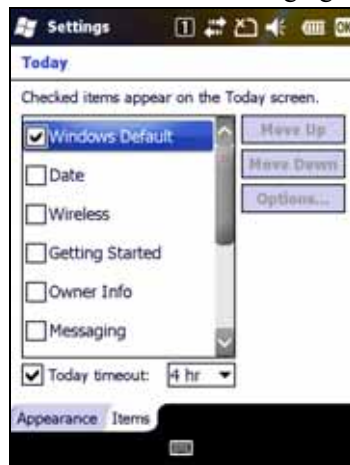
Figure 3-11

To add or remove items in the Today screen, check the checkbox next to each item name to add, or remove the check to remove. To change the listed order of an item displayed in the Today screen, select the item and tap **Move Up** button for upper position or **Move Down** button for lower position.

3.6   Buttons

This applet is for setting parameters concerned with operations with the keyboard.

Program Buttons Tab

This tab is for reassigning a program to a key.
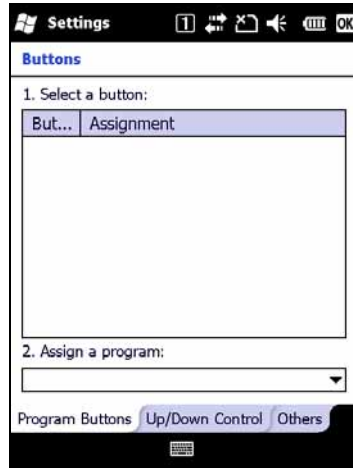
Figure 3-12

Note:
The IT-9000 has no keys that you can assign program in this applet.

Up/Down Control Tab

This tab is for specifying the key repeat rate.
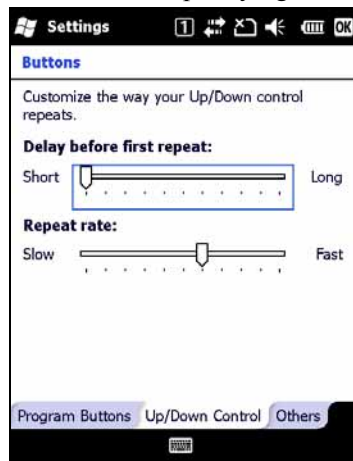
Figure 3-13

Delay before first repeat:

This adjustable slide is to set a waiting time period until when repeating key entry starts.

Repeat rate:

This adjustable slide is to set an interval between repeating key entries.

Others Tab
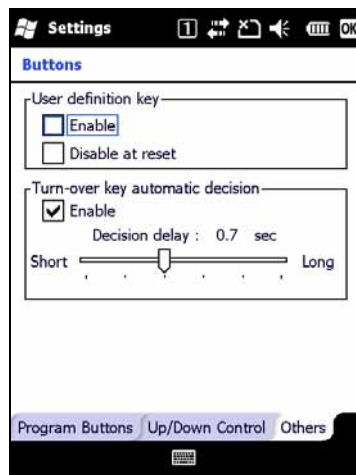
Figure 3-14

User definition key

Specify "Enable" or "Disable" for the user definition key.

Turn-over key automatic decision

Specify "Enable" or "Disable" for the turn-over key automatic decision. If "Enable" is chosen, set a period of time to wait for the decision delay.

3.7 Input

This applet is for changing the current input method and options.

Input Method Tab

Figure 3-15

To change the input method, select a favorite method in the **Input method** pull-down menu.

Block Recognizer	:	Use a single stroke to write letters, numbers, symbols, and punctuation, which are then converted into typed text. Do gestures to enter Return and Backspace.
Keyboard	:	Tap keys on the keyboard displayed on the screen to enter text.
Letter Recognizer	:	Write individual letters, numbers, and punctuation, which are converted into typed text.
Transcriber	:	Write in cursive, print, or mixed handwriting (consisting of both cursive and print), and convert your writing into typed text.

Word Completion Tab

This tab is for setting the word completion feature.
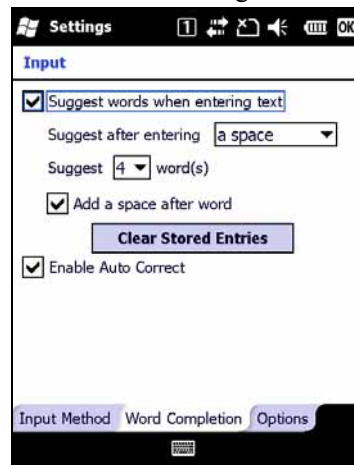
Figure 3-16

To enable the word completion feature, select **Suggest words when entering text** checkbox and set other relevant options.

Options Tab

This tab is to adjust preferences for writing and recording.
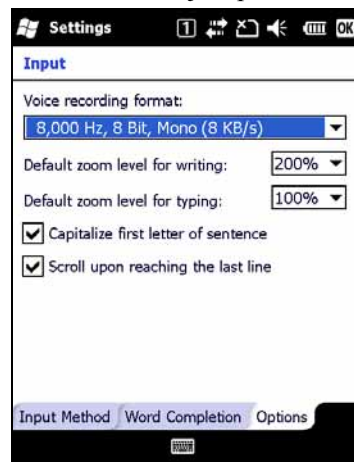
Figure 3-17

3.8   Owner Information

This applet is for setting information related to the owner.

Identification Tab

Figure 3-18

Name
This field is for specifying the owner's name inputting alphabets from the Input Panel appeared at the lower part on the screen.

Company
This field is for specifying name of the company that the owner belongs to.

Address
This field is for specifying an address.

Telephone
This field is for specifying a phone number.

E-mail
This field is for specifying an e-mail address.

Notes Tab
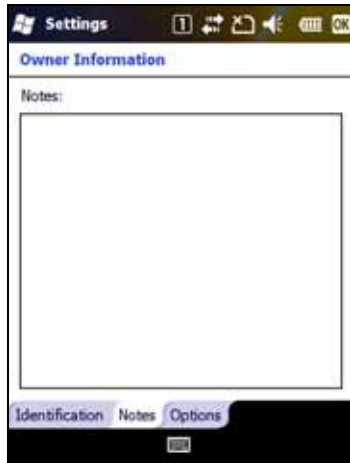
Figure 3-19

Notes

Using this field, a memo can be freely written.

Options Tab

Figure 3-20

To display identification information or note when starting up the terminal, select either the **Identification information** checkbox or the **Notes** checkbox.

3.9 About

This applet is used for displaying and setting parameters concerned with the internal system of the terminal.

Version Tab

This tab displays OS version, integrated CPU name and available RAM size.

Figure 3-21

Device ID Tab

Figure 3-22

Device name:

This field is for setting device name for the terminal itself. Spaces with device name entered in the field are not allowed.

Description:

This field is to enter text string for the device description.

Copyrights Tab

This tab is for displaying the OS copyright information.

Figure 3-23

3.10 Backlight

This applet is for setting brightness for the power source provided by either installed battery or external power source from the dedicated AC Adaptor directly connected to the terminal or connected via cradle, the backlight auto dimming, and the backlight auto off.

Note:
Do not remove the check from **Turn off backlight when a button is pressed or the screen is tapped** checkbox in both Battery Power Tab (see Figure 3.20) and External Power Tab (see Figure 3.21). The backlight does not turn on when turning on the power with Power key or the backlight auto off function does not perform correctly if the check is removed.

Battery Power Tab
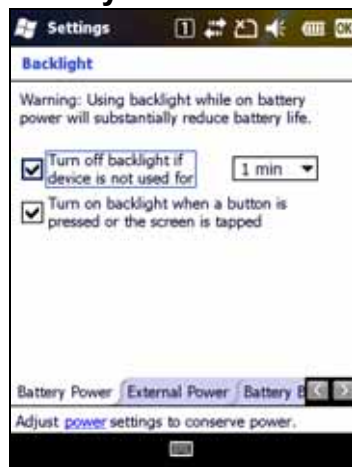
Figure 3-24

To set the backlight auto off, select **Turn off backlight if device is not used for** checkbox, and a period of elapse time in the pull-down menu.

Please do not exclude the **Turn on backlight when a button is pressed or the screen is tapped** check box.

External Power Tab

Figure 3-25

To set the backlight auto off, select **Turn off backlight if device is not used for** checkbox, and a period of elapse time in the pull-down menu.

Battery Brightness Tab
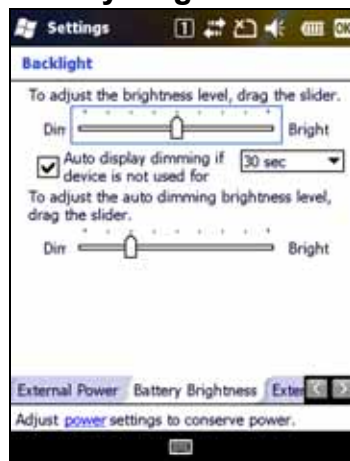
Figure 3-26

Brightness level
The upper slider is for specifying brightness in one of nine grades which becomes effect while battery pack is being used as the power source.

Auto dimming brightness
The lower slider is for specifying brightness in one of eight grades which becomes effect when the auto brightness dimming mode starts up. This auto brightness dimming mode is operable only during battery pack is used as the power source.

External Brightness Tab

Figure 3-27

Brightness level

The slider is for specifying brightness in one of nine grades which becomes effect while an external power supply - by the dedicated AC Adaptor connected directly to the terminal or connected via cradle - is used as the power source.

3.11 Buzzer

This applet is to set up "Enable" or "Disable" for buzzer sound and its sound volume in one of the three grades (minimum, medium, and maximum) for each event. Setting on the sound volume can be checked by clicking the respective triangle buttons on the right side.

Figure 3-28

3.12 Certificates

This applet is used for editing certificates trusted by the user.

Personal Tab

Figure 3-29

Personal certificates identify the user of the terminal.

Intermediate Tab

Figure 3-30

Intermediate certificates help authenticate certificates received from other hosts.

Root Tab

Figure 3-31

Root certificates authenticate certificates received from other hosts.

3.13 CPU Speed

This applet is for setting the CPU operating speed.
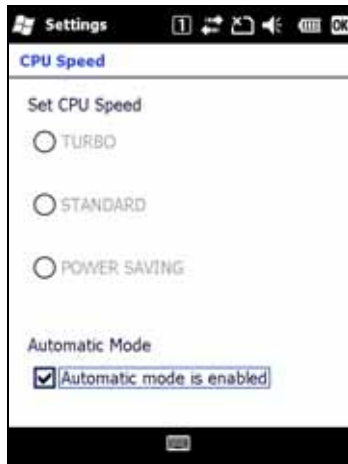
Figure 3-32

TURBO
This mode sets the CPU frequency to 624 MHz. The mode is disabled when the Automatic Mode is set effect.

STANDARD
This mode sets the CPU frequency to 312 MHz. The mode is disabled when the Automatic Mode is set effect.

POWER SAVING
This mode sets the CPU frequency to 208 MHz. The mode is disabled when the Automatic Mode is set effect.

Automatic Mode
This mode automatically switches the CPU frequency to either **TURBO**, **STANDARD**, or **POWER SAVING** mode according to the load on the CPU. Check the checkbox to set the mode.

3.14 Customer Feedback

This applet is for enabling Customer Feedback.
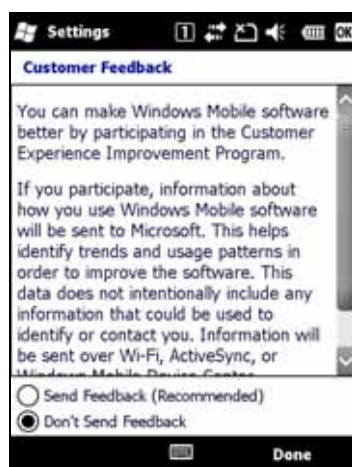
Figure 3-33

While Customer Feedback is enabled, general usage information is collected and sent to Microsoft. No personally identifiable information is collected, and there are no airtime charges to you.

3.15 Encryption

This applet is for enabling to encrypt files placed on storage cards.

Figure 3-34

Encrypt files when placed on a storage card
Encrypted files are opened just like other files, provided you are using the terminal that encrypted them. There is no separate step for you to take to read these files.

3.16 Error Reporting

This applet is for enabling Error Reporting.

Figure 3-35

While Error Reporting is set enabled, serious error information is collected and sent to Microsoft.

3.17 External GPS

This applet is used to configure the built-in GPS receiver.

Programs Tab

This tab is for selecting the port from which programs will access GPS data. The program port must be a different port than the one specified as the hardware port.
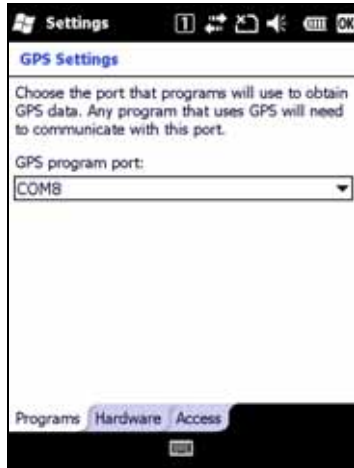
Figure 3-36

Hardware Tab

This tab is for selecting the port to which your GPS receiver is connected. The hardware port must be a different port than the one specified as the program port.

Figure 3-37

Access Tab

This tab is for enabling multiple programs to access GPS data simultaneously, the terminal automatically manages access to your GPS receiver. It is highly recommended that this option always be selected. Otherwise, only one program at a time can access your GPS receiver.
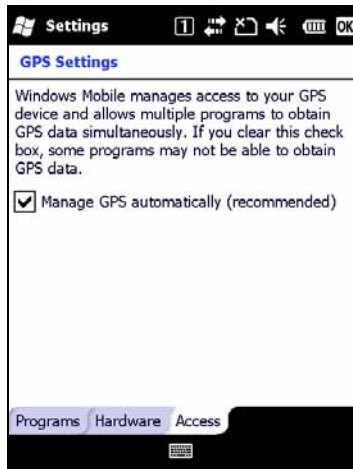
Figure 3-38

3.18 Imager Setting

This tool allows the user to change the parameters and operating modes required for reading 1D and 2D bar code symbologies with the integrated CMOS imager (model dependant). The changed parameters and modes are saved in ini file and become effect automatically when the **TDRead** application invokes.

1D and 2D Tabs

These tabs are to set up the 1D bar code symbologies in the 1D tab and 2D bar code symbologies in the 2D tab respectively. The checkboxes with check marks enable the bar code symbologies to be read. Or, removing the check mark disables the bar code symbology not to be read.
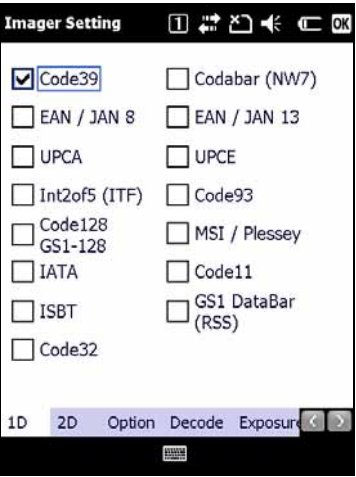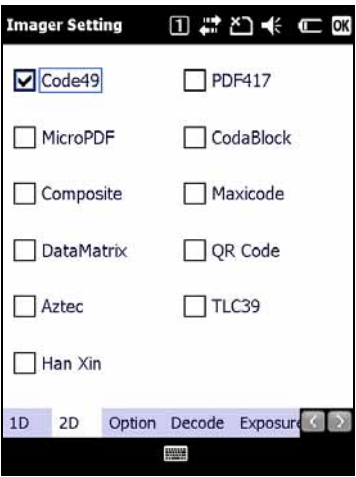
Figure 3-39   Figure 3-40

Option Tab

This tab is to set up relevant options for scanning a symbol of the specified bar code symbology.
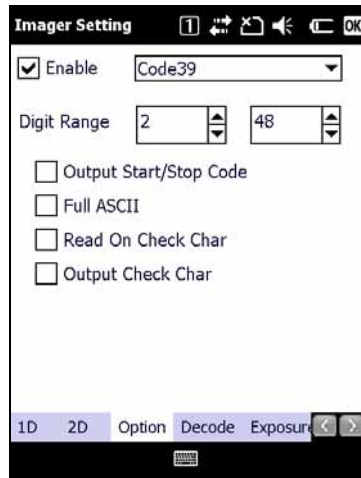
Figure 3-41

Enable

With a check mark in the checkbox, it is possible to scan the bar code symbology selected in the pull-down menu.

Digit Range

This field is to set up the effective range of reading symbol of the selected bar code symbology, the pull-down menu on the left side is for the minimum number of digits and the other on the right side is for the maximum number of digits. A symbol of the selected bar code symbology meeting these four options can only be scanned and decoded.

Decode Tab

This tab is to set up options for decoding scanned bar code data.
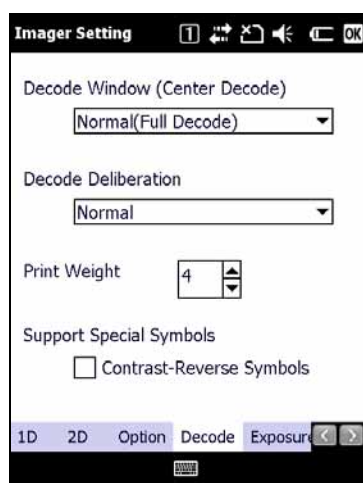
Figure 3-42

Decode Window

This field is to specify decode window mode by selecting one in the modes listed below.
Except the Normal mode, decode range will be decided automatically for only scanning symbol at center area.

- Normal(Full Decode)
- Center Decode (1D/2D Codes)
- Center Decode (Composite)

Decode Deliberation

This field is to specify decode deliberation mode by selecting one in the modes listed below. If it is set up to "Very Quick" or "Quick", the decoding speed becomes fast though the number of symbols to be decoded is limited instead. Or, if it is set up to "Deliberate" or "Very Deliberate", the speed becomes slow though the number of symbols to be decoded is increased.
- Very Quick
- Quick
- Normal
- Deliberate
- Very Deliberate

Print Weight

This field is to set up the intensity in the range of 1 to 7 for target printed symbol. Setting a value higher improves reading symbol printed in dark color, or lower improves reading symbol printed in pale color.

Support Special Symbols (Contrast-Reverse Symbols)

This field is to set up scan special symbols which is contrast-reverse symbols (printed white color in black color background).

Exposure/LED Tab

This tab is to specify the intensity for both LEDs, Aimer and Illumination.
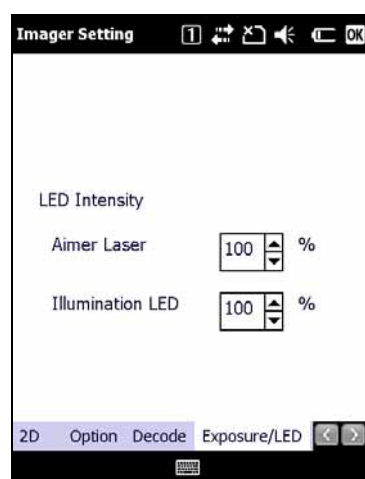
Figure 3-43

Aimer Laser

This field is to set the intensity of the Aimer to either "0" for turning off or "100" for turning on.

Illumination LED

This field is to set the intensity of the Illumination to either "0" for turning off or "100" for turning on.

Multi Step Tab

This tab is to specify a reading mode by selecting one of the radio buttons in the figure.
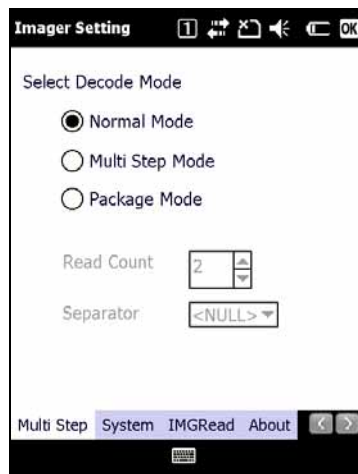
Figure 3-44

Normal Mode

This radio button selects the normal read mode.

Multi Step Mode

This radio button selects the multi-step read mode which continuously reads multiple symbols until when the Trigger key is released.

Package Mode

This radio button selects the package read mode which continuously reads multiple symbols until when the Trigger key is released and then outputs a result of reading all the symbols.

Read Count

This field is to set the number of symbols to read in the Multi-step and Package modes.

Separator

This field is to set a character as the delimiter inserted in between decoded data of scanned bar codes in the Package mode.

System Tab

This tab is to set a period of time for the APO (Automatic Power OFF) function to activate and "Enable" or "Disable" for turning on the power on the terminal with the Trigger key.

Figure 3-45

Scanner APO

This filed is to set a period of time in the range of 0 to 1800 (in second) for the APO function to activate. Setting "0" will disable the function.

Power up device with trigger key

This checkbox is to set "Turning on the power of the terminal with the Trigger key" effect. With a check mark in the checkbox, the power on the terminal can be turned on when one of the Trigger keys is pressed down.

IMGRead Tab

This tab is for setting the parameters for "Image Scanner Read".
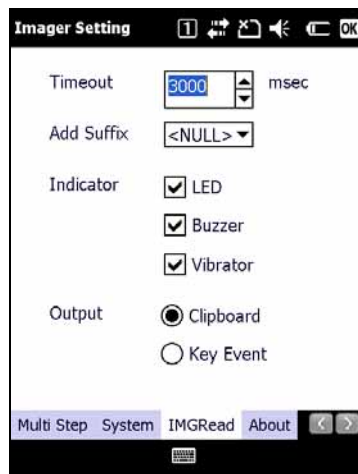
Figure 3-46

Timeout

This field is to set a time period for the Timeout to activate in scanning operation. Scanning terminates either when the Trigger key is released or when the time period in milliseconds set in this field elapses.

Add Suffix

This field is to specify a suffix that is appended at the end of each decoded data.

Indicator

These two checkboxes are to set scanning completion notification method with either LED or sound or both. Notification method with a check mark in the checkbox will activate when scanning a symbol is complete.

Output

These two radio buttons are to specify an output method for decoded bar code data selecting either one of the buttons.

About Tab

This tab displays current version information of the imager setting tool.

Figure 3-47

3.19 Managed Programs

This applet is used for displaying the information about programs installed by your system administrator.

Figure 3-48

3.20 Memory

This applet is used to view the usage of main memory and storage card memory.

Main Tab
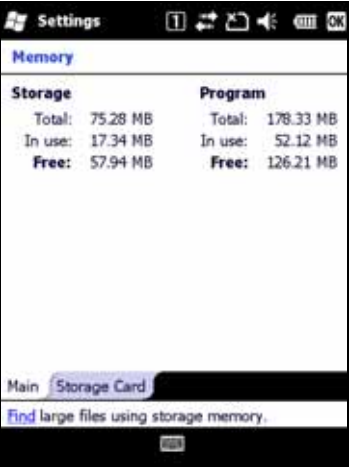
Figure 3-49

The amount of memory allocated to file and data storage versus program storage is displayed, as well as the amount of memory in use versus the available memory.

Storage Card Tab

Figure 3-50

You can see how much memory is available on a storage card that is inserted into your terminal.

3.21 Setting Printer

This **Printer Setup Tool** is used to set up or modify the settings of various functions required for printing. The **Printer Setup Tool** is stored in the Control Panel. Initiate it as necessary.

List of the settings

The following table shows a list of Printer Setup Tool setup items. Since these settings are stored in the registry, they can be retained even if a normal reset is carried out. If there is a need to forcibly initialize them, transmit the ESC initialization command to the printer or perform a full-reset.

Table 3.5

Setting	Description	Remark
Paper Setup	Specify the paper type.	5 kinds
Print Quality Setup	Specify the print density.	9 levels
	Specify the print speed.	Quick, Slow (high quality), Graphic
Function Setup	Specify the pre-heating.	Enable/Disable
	Specify the "Continuous printing after error".	Enable/Disable
Function Setup2	Specify the Marker Detection	Begin/End
	Specify the Splash Cover Error Control	System/Application
Status Display	Display the printer status.	Displays and confirm the printer status.

- The Printer Setup Tool functions
  The functions are used to set up or modify the settings of various printer functions as required.

Initial Status

The tabs in Figures 3.51 - 3.53 display the initial status of the printer settings. The initial status to be displayed is the latest status when the tabs are opened.
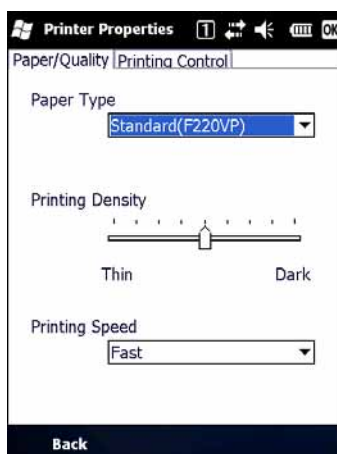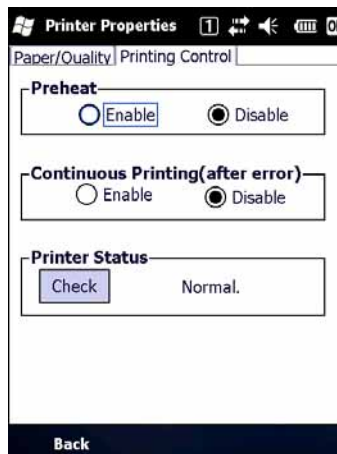
Figure 3-51   Figure 3-52   Figure 3-53
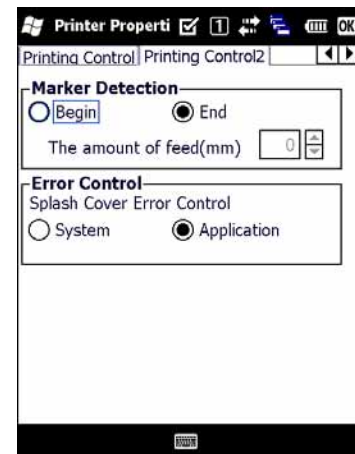
- To set the setting effect, tap **OK** button.
- If **OK** button is tapped, the setup conditions are automatically updated and the dialog screen disappears.

- In order to make multiple settings at a time, tap **OK** button only after making all necessary modifications.

Paper Type

In this field, set up the paper type to use for printing. This ensures that the specified paper can be used to print characters with the optimum parameters.
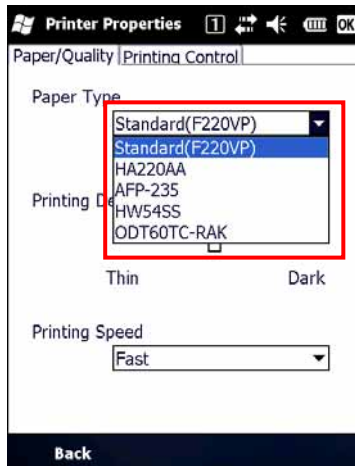
Figure 3-54

From the list of paper types in the combo box, choose the paper to be used. The following five paper types can be selected.
- F220VP (= Default)
- HA220AA
- AFP-235
- HW54SS
- ODT60TC-RAK

Printing Density

This field is used to set up the print density. There are 9 levels of print density that can be set up. Move the slider knob to the right or left to modify the print density. If the slider knob is moved to the left, the print density decreases, or if it is moved to the right, it increases. The default setting is at the fifth gradation from the left.
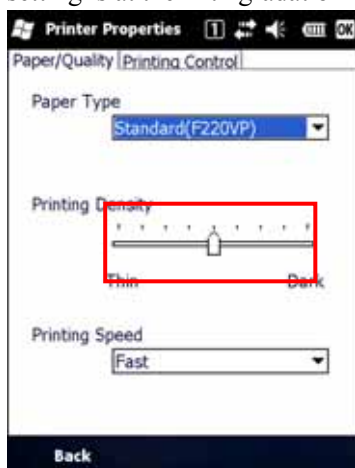
Figure 3-55

Printing Speed

Select the desired print speed from the list of the print speeds in the combo box.

- Fast
- Slow (High-Quality) (= Default)
- Graphic
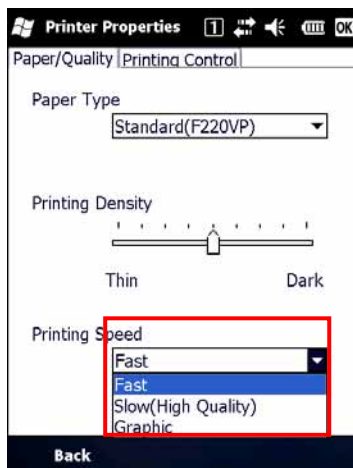
Figure 3-56

Printing Control Tab

Preheat

This field is used to set up "Enable" or "Disable" for the pre-heating.

    Enable   : Enables the pre-heating.

    Disable   : Disables the pre-heating (= Default).
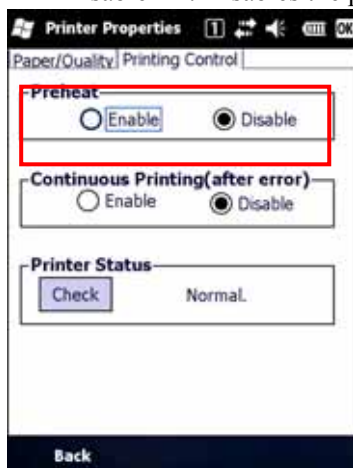
Figure 3-57

Continuous Printing (after error)

This field is used to specify whether the printing should continue at a time when an error occurs or should stop.
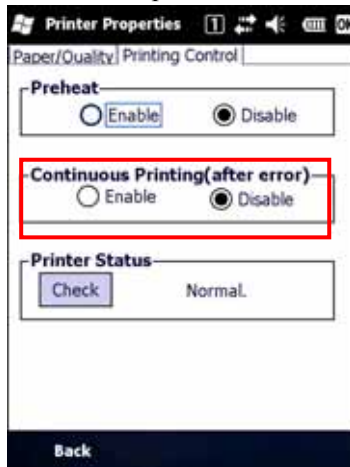
Figure 3-58

Printer Status

This field is to display the current printer status. **Check** button displays the latest condition on the printer. The latest status can also be displayed if the tab is switched to other tab or when the Printer Control tab is re-displayed. Depending on the printer condition, the initial status display may vary when the dialog is invoked.
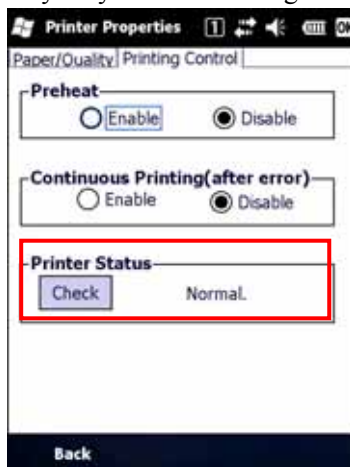
Figure 3-59

Printing Control2 Tab

Marker　Detection

This field is used to set up "Begin" or "End" for the Marker Detection.
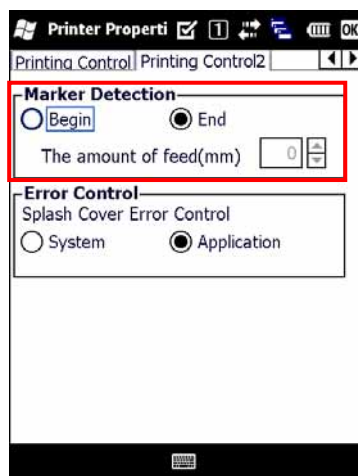
Figure 3.60

      Begin　　:the marker is detected when it enters the area over the marker sensor
      End　　　:the marker is detected when it has passed over the marker sensor(=Default)
The amount of feed can be selected in the range of 0 to 12 mm (0 mm by default).
This is grayed out if "End" is selected.

Error Control

This field is used to set up "System" or "Application" for the Error Control of Splash Cover.
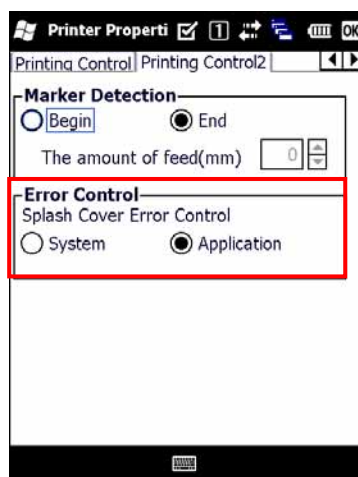
Figure 3.61

      System　　: The Splash Cover Error control by system
      Application: The Splash Cover Error control by application(=Default)

Table 3.6   List of printer statuses and messages

Displayed message	Description	Remedy
Normal	Indicates that the printer is in normal condition. No anomaly is found with the printer.	
Printer is not opened	The printer driver is in a state that it cannot be opened.	• Perform a reset on the terminal. • If the condition persists even after the resetting, contact a CASIO service provider.
Driver is not loaded.	Either other application occupies the printer now, or the printer driver is in a state that it cannot be loaded.	• Check if other application uses the printer. If not, reset the terminal. • If the condition persists even after the reset takes effect, contact a CASIO service provider.
Printer is already opened.	Another application is using the printer.	• Check if other application is using the printer.
Hardware failure	A printer hardware anomaly has occurred.	• Perform a reset on the terminal. If the condition persists even after a reset takes effect, contact a CASIO service provider.
Platen open	Platen is opened (lifted up).	• Close the platen.
Paper end.	The printer has no paper.	• Load a paper in place.
VDETP occurred.	Not possible to print. The battery remained capacity is not sufficient.	• Replace the battery pack.
Head temperature error.	The printer head temperature is extremely high.	• Leave the printer not operating for a while. • If the problem occurs frequently, contact a CASIO service provider.
Executing paper feed.	The printer is now feeding paper as the result of pressing the FEED key.	
Printer error occurred.	Either a printer driver or printer hardware anomaly.	• Perform a reset on the terminal. • If the condition persists even after the reset takes place, contact a CASIO service provider.
Splash cover closed	Splash cover is closed.	• Open the splash cover.

3.22 Regional Settings

This applet is for setting display method and format of your regional items such as numeric value, currency, date, and time.

Region Tab

This tab is for selecting your language and regional items. The items you select determine which options are selected by default on the other tabs.
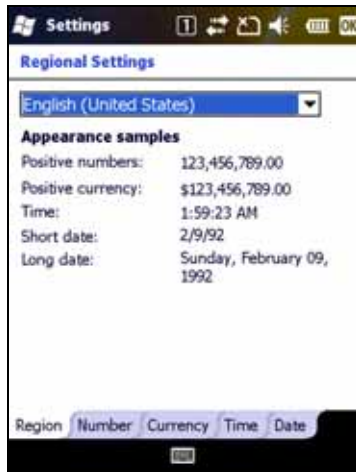
Figure 3-62

Number Tab

This tab is for setting display format of numeric value.

Figure 3-63

Currency Tab

This tab is for setting display format of currency.
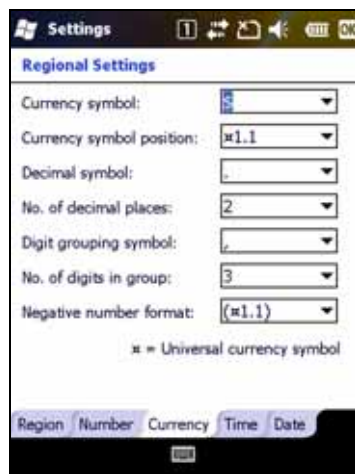
Figure 3-64

Time Tab

This tab is for setting display format of time.
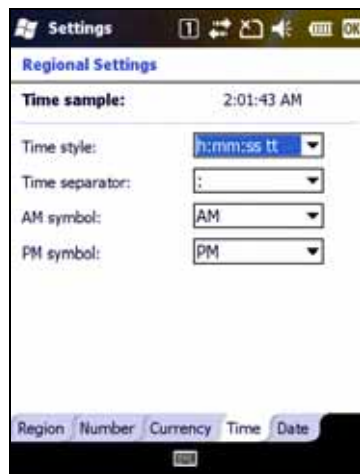
Figure 3-65

Date Tab

This tab is for setting display format of date.

Figure 3-66

3.23 Remove Programs

This applet is used to display all programs installed in the terminal and delete them. To remove a program, highlight the program in the field (see Figure 3.57) you want to remove, and tap **Remove** button.

Figure 3-67

Note:
Programs burnt in the ROM in the terminal cannot be deleted.

3.24 Screen

This applet is for changing the screen orientation, aligning the screen, and adjusting the text size.

General Tab
This tab is for changing the screen orientation and aligning the screen.

To change the screen orientation, tap one of the **Orientation** radio buttons.
To realign the touch screen, tap **Align Screen** button and follow the instruction appeared.

Figure 3-68

Clear Type Tab
This tab is for enabling a font-smoothing technology.
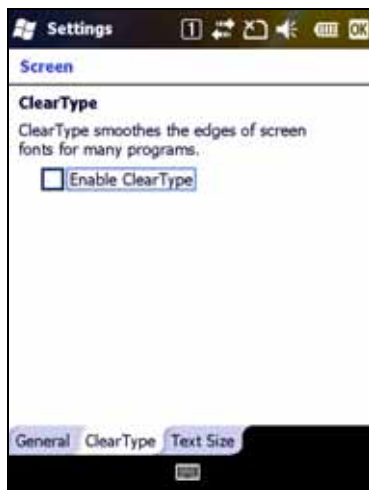
Figure 3-69

Text Size Tab

This tab is to adjust the text size.
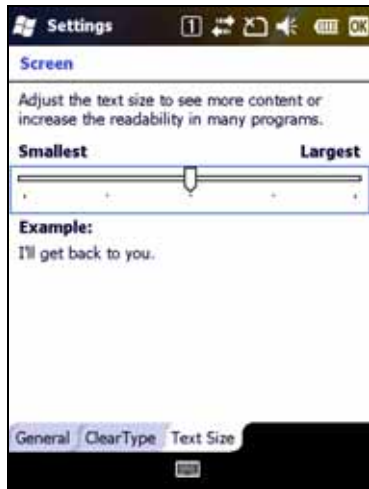
Figure 3-70

To adjust the text size, move the slider right or left to increase or decrease the text size.

3.25 Task Manager

This applet is used to view running tasks, switch tasks, and stop tasks.

Figure 3-71

1. To switch to selected program, tap the program that you want to use and navigate to **Menu** → **Switch To**.
2. To stop running program, tap the program that you want to stop and tap **End Task**.
3. To stop all running programs, navigate to **Menu** → **End All Tasks**.

Table 3.7   Menu in the applet

Menu			Description
End Task			Ends the selected program.
Menu			
	Switch To		Switches to the selected program.
	End All Tasks		Ends all running programs.
	View		
		Applications	Displays all running programs.
		Processes	Displays all running processes.
	Sort By		
		Memory	Displays program list sorted by memory size.
		CPU	Displays program list sorted by CPU usage.
		Name	Displays program list sorted by name.
	Refresh		Updates to the latest information.
	Exit		Exits the Task Manager.

3.26 USB Connection

This applet displays connection establishment with PC or other device in USB mode. It is also used to change the connection related parameter settings.

Connect Status Tab
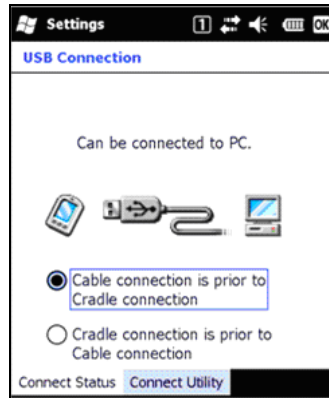
Figure 3.72

Can be connected to PC message appears in the tab when the terminal is connected to PC in USB Client mode. Or, **Can be connected to LAN or modem** message appears when the terminal is connected in USB Host mode.

Cable connection is prior to Cradle connection
Set this radio button effect to make connection by USB cable effective when USB cable is connected to the terminal directly and terminal is on the cradle. The radio button is set effect by default.

Cradle connection is prior to Cable connection
Set this radio button effect to make connection by the cradle effective when USB cable is connected to the terminal directly and terminal is on the cradle.

Tab the OK button if you change above setting and wish to make it effective.

Connect Utility Tab
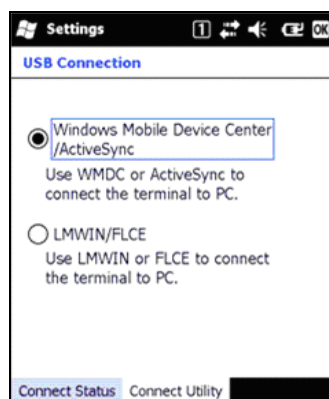
Figure 3.73

Windows Mobile Device Center/ActiveSync

Set this radio button effect to establish connection in Windows Mobile Device Center (or ActiveSync) between the terminal and PC via the USB connection. The radio button has been set effect by default.

LMWIN/FLCE

Set this radio button effect to establish connection in LMWIN (or FLCE) between the terminal and PC via the USB connection.

Tab the OK button if you change above setting and wish to make it effective.

3.27 Version Info

This applet is used to display each version number of the OS, boot section, loader, and service pack integrated in the terminal.

CVersion	⊡ ⇄ ⍾ ◀ ▥ ✕
Platform :	CASIO PY011 WM6.5
ROM ID :	1202-0610
Build ID :	650121
CPU TYPE :	Marvell ARM920T PXA320
IPL :	4.02.03
BootLoader :	4.02.01
Service Pack :	0.00

OK

CVersion: 4.00 HT
(C) CASIO Computer Co.,Ltd.

Figure 3-74

3.28 Beam

This applet is for enabling to receive all incoming Bluetooth beams.
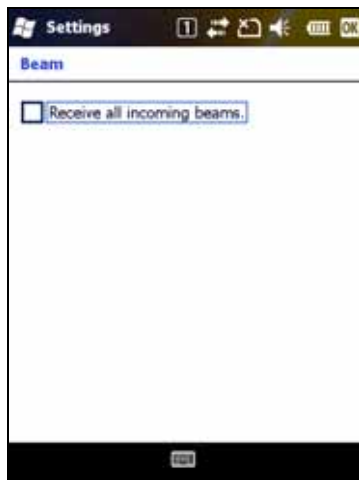
Figure 3-75

To enable you to receive all incoming beams, check the **Receive all incoming beams** checkbox.

Note:
To conserve battery power, make the **Receive all incoming beams** effect only for a period you are receiving beamed files.

3.29 Connections

This applet is for setting up multiple network connections.

Tasks Tab
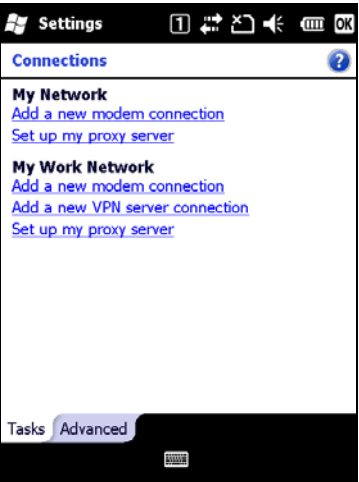
Figure 3-76

To establish connection in GPRS, refer to "WAN Settings".

Advanced Tab
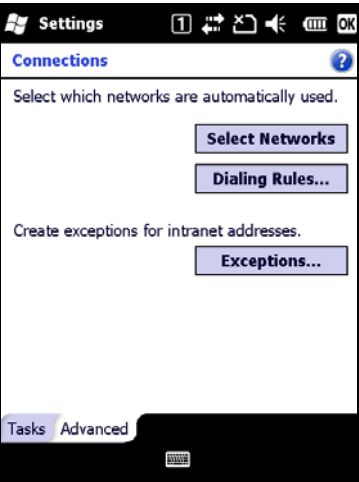
Figure 3-77

3.30 Domain Enrollment

This applet is used to enroll the terminal to your company network.
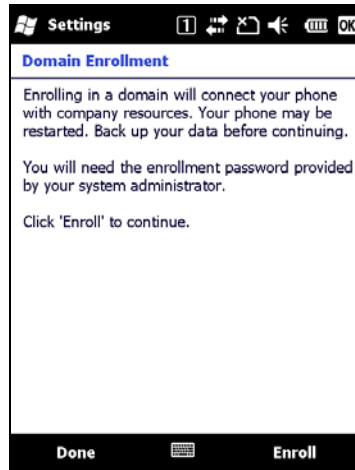
Figure 3-78

3.31 Network Cards

This applet is used to configure network adapters.

Figure 3-79

The installed network adapter drivers are listed here.
Tap the adapter that you want to configure.

Note:
In some cases, this applet is displayed as the "**Network Adapter**" tab of the "**Wireless Configuration**" applet.

3.32 USB to PC

This applet is for enabling advanced network functionality.
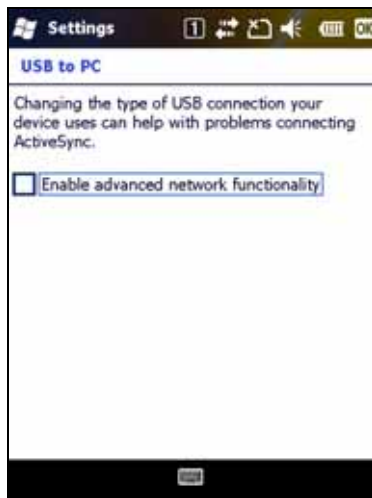
Figure 3-80

To troubleshoot an ActiveSync cable connection, select **Enable advanced network functionality** checkbox.

3.33 WAN Settings

This tool performs the WAN module power source settings, security settings, identification data settings, operator settings and status display.

Power Tab

This tab is to perform the WAN module power source ON/OFF settings.
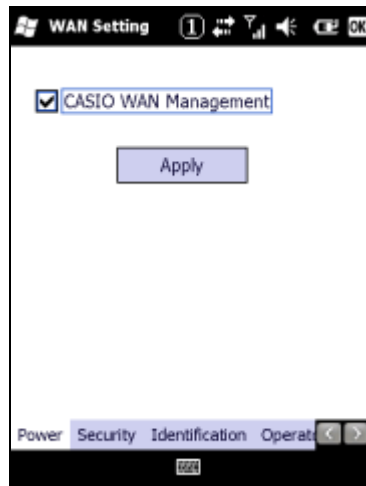
Figure 3-81

CASIO WAN Management

This checkbox configures the WAN module power source to ON or OFF.

Apply Button

This button applies the settings selected in the checkbox.

* Note :

When you execute reset operation, this checkbox will be unchecked if you have checked before this checkbox.

Before execute WAN detail setting, you must check "CASIO WAN Management" checkbox setting and press "Apply" button. After that you can set WAN detail setting.

Security Tab

This tab provides the following functions according to the current SIM lock mode (unlock mode, PIN input standby mode or PUK input standby mode).

SIM "Enable" or "Disable" setting is carried out in the Unlock mode. It is also possible to change the PIN code. A PIN code must be entered twice to change it.
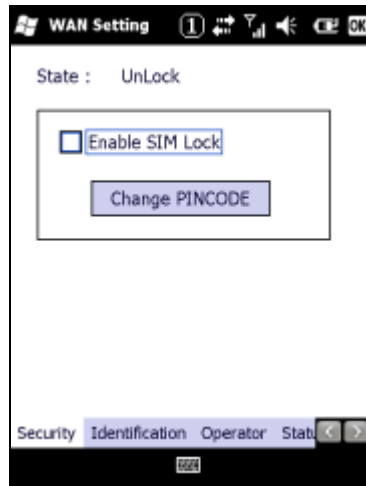
Figure 3-82

State

The current SIM lock status is shown as "UnLock".

Enable SIM Lock

This checkbox sets the SIM lock to "Enable" or "Disable". This configuration can only be disabled by bringing up the PIN code input dialog box and entering the correct PIN code.

Change PINCODE Button

This button displays the new PIN code dialog box where new PIN codes can be entered.

The SIM status can be changed to "Lock" by entering the correct PIN code in the PIN input standby mode.
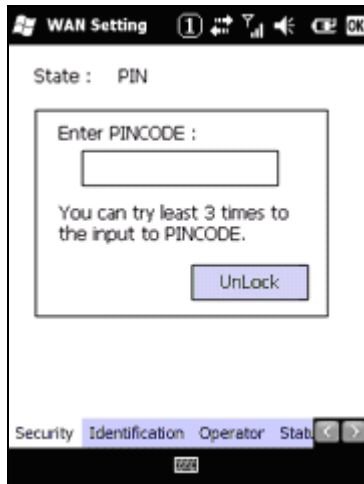
Figure 3-83

State
The current SIM lock status is shown as "PIN".

Enter PINCODE
Input the PIN code to change the lock status to "UnLock".

PIN Counter
This displays the PIN code entry count for the current status.

UnLock Button
Entering the correct PIN code and clicking the "Enter PIN Code" box changes the lock status to "UnLock". If an incorrect PIN code is entered, the "PIN Counter" is revised and an error message appears.

A new PIN code can be set by entering the correct PUK code in the PUK input standby mode. The PIN code must be entered twice for a new PIN code to be set.
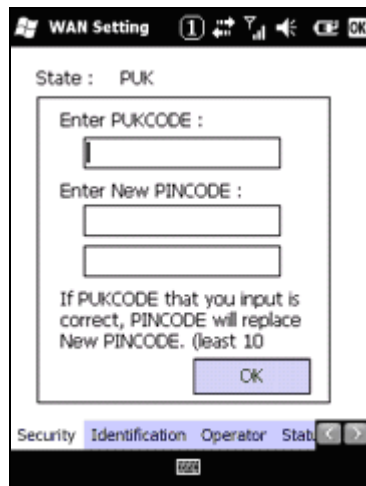
Figure 3-84

State
The current SIM lock status is shown as "PUK".

Enter PUKCODE
Input the PUK code to reset the PIN code.

Enter New PINCODE
To reset the PIN code, enter the new PIN code then re-enter it in the second field for confirmation.

PIN Counter
This displays the PIN code entry count for the current status.

OK Button
Press this button to set the new PIN code. An error message appears if a wrong PUK code is entered.

Identification Tab

This tab displays the following identification data for the WAN module and the SIM card.

Figure 3-85

Vendor

This displays the name of the WAN module manufacturer.

Module

This displays the model number of the WAN module.

Revision

This displays the GSM/GPRS module revision number.

IMEI

This displays the telephone's unique number (International Mobile Equipment Identity).

IMSI

This displays the subscriber's identifier (International Mobile Subscriber Identity). The number is shown as "---" when the SIM lock is enabled.

MSISDN

This displays the telephone number (Mobile Subscriber ISDN Number). The number is shown as "---" when the SIM lock is enabled.

Operator Tab

This tab enables the method of connecting the terminal with the operator (automatic connection, manual connection or adapt mode) to be set. The display screen changes depending on the present connection method setting.

If the current Connect mode is set to Auto, the connection mode can be set.
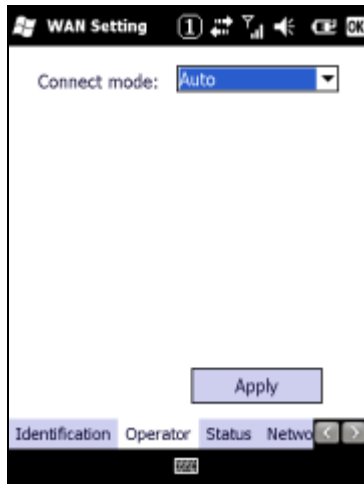
Figure 3-86

Connect mode

Choose the method for connecting the terminal with the operator in the pull-down menu.

Apply Button

Enables the changes made on this screen.

If the connection method is set to manual connection or adapt mode, seeking is performed to locate connectable operators and the results are listed. The operators to be connected can then be selected from this list. Alternatively, a connection can be established with an operator by directly inputting their operator ID.
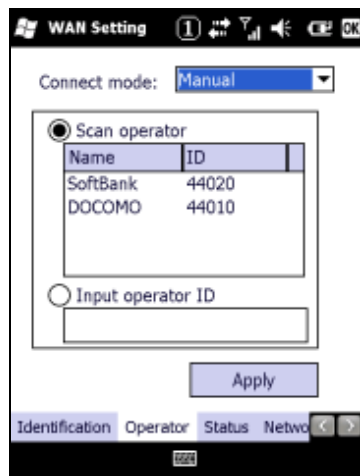
Figure 3-87

Connect mode
Choose the method for connecting the terminal with the operator in the pull-down menu.

Scan operator
This retrieves operators which can be connected (default).

Scan operator list
This displays a list of the connectable operator names and IDs.

Input operator ID
This radio button enables direct input of the operator to be connected. Selecting this item cancels the operator scan.

Apply Button
This button applies the changes made on this screen.

Status Tab

This tab displays the following information on the signal strength, operator connection and network.
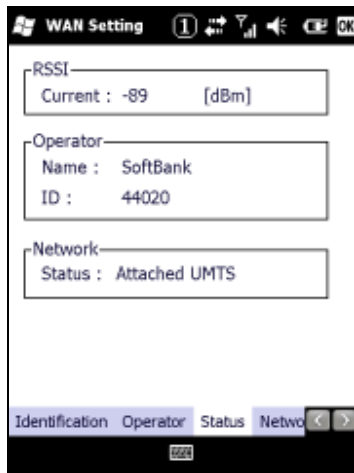
Figure 3-88

Current

This indicates the current received signal strength.

Name

This displays the name of the operator who is currently connected.

ID

This displays the ID of the operator who is currently connected.
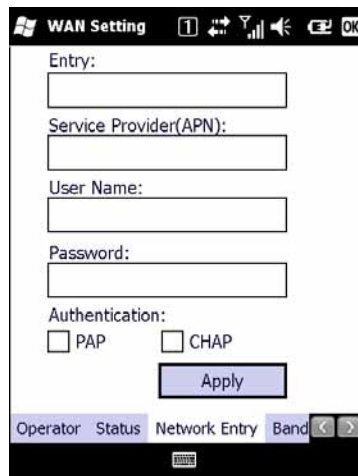
Status

This displays one of the current statuses for the WAN module.

- Available GPRS → GPRS is supported
- Attached GPRS → Connected via GPRS
- Available EGPRS → EGPRS (EDGE) is supported
- Attached EGPRS → Connected via EGPRS (EDGE)
- Not available GPRS/EGPRS → Not supported

Network Entry Tab

This tab is for setting the Access Point Name of the service provider.

Entry

Input a connection name.

Service Provider(APN)

Input the Access Point Name from the service provider.

User Name

Input the User Name from the service provider.

Password

Input the Password from the service provider.

Authentication

Select the authentication type from the service provider.

Apply Button

This button applies the settings entered in this tab.

For use of this tab in detail, refer to **Establishing GPRS Connection**.

Version Tab

This tab displays the WAN configuration version.

Establishing GPRS Connection

To establish GPRS connection, follow the steps below.

1. Configure the WAN power to ON using the WAN Settings tool.
2. Set the SIM lock disable using the WAN Settings tool.
3. Choose the operator using the WAN Settings tool.
4. Create a new connection using the WAN Settings tool.
5. Edit the connection settings using the Connections tool.
6. Establish GPRS connection using the Connections tool.

Note:
With the WANGPRS Library, it is possible to develop an application that supports above the actions.

The following shows the GPRS connection process in detail.

Step 1: Configure the WAN power to ON using the WAN Settings tool

1. Navigate to **Start** → **Settings** → **Connections** tab and then double tap **WAN Setting** icon. **WAN Setting** screen shown below appears.
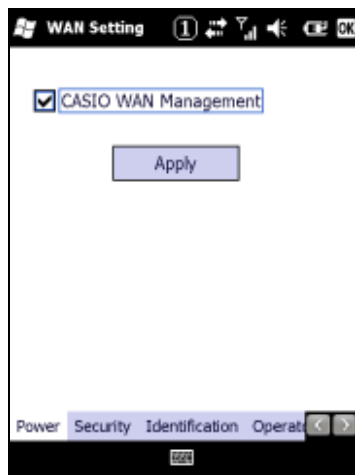
Figure 3-89

2. Check **CASIO WAN Power** checkbox and tap **Apply** button.

Step 2: Set the SIM lock disable using the WAN Settings tool

1. Dismount the check from the **Enable SIM Lock**. If the SIM lock mode is set effect, reset the PIN lock by inputting the correct PIN code in **Security** tab. The SIM lock mode is reset.
2. If the current SIM lock status shows "UnLock" in **State** field (see Figure 3.90), it is not necessary to reset the PIN lock because the PIN lock function is not used.
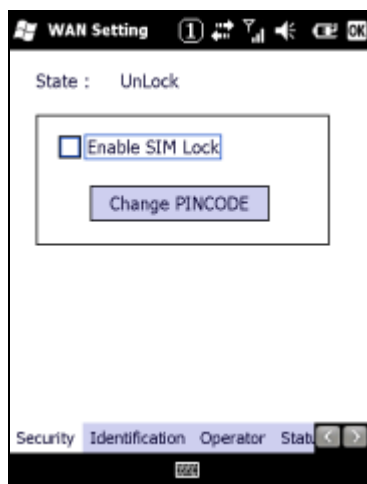
Figure 3-90

3. If the current SIM lock status shows "PIN" in **State** field (see Figure 3.91), it is necessary to reset the PIN lock. Input the correct PIN code in **Enter PINCODE** edit box and tap **Unlock** button. After entering the correct PIN code, the SIM lock status will show "UnLock" in **State** field indicating the PIN lock state is reset.
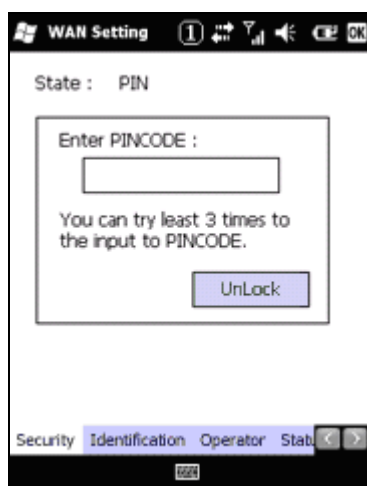
Figure 3-91

Note:
The limited number of inputting your PIN code is indicated underneath **Enter PINCODE** edit box (see Figure 3.91). In any case your PIN code entry exceeds over this limitation, the PIN status changes to "PUK". This indicates you need to contact your SIM card supplier to obtain PUK code. While you are entering PIN code, pay your attention not to exceed the limitation.

Step 3: Choose the operator using the WAN Settings tool

1. Choose your suitable operator in **Connect mode** field (see Figure 3.92) to establish connection with the terminal by enumerating in **Operator** tab.

Auto mode:

The Auto mode is to establish connection with an operator by referring to the operator list saved in the SIM card. If you wish to set your operator in this mode, choose **Auto** in **Connect mode** combo box and tap **Apply** button.
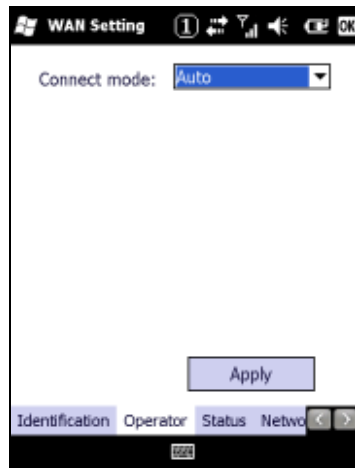
Figure 3-92

Manual mode:

Choose **Manual** in **Connect mode** pull-down menu. And check **Scan operator** radio button and choose an operator in **Scan operator** list box, or check **Input operator ID** radio button and input an operator ID in the edit box. Tap **Apply** button.
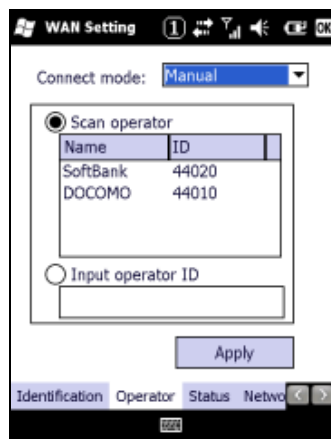
Figure 3-93

Adaptive mode:

Choose **Adapt** in **Connection mode** pull-down menu. Follow the setting procedure detailed in the Manual mode to choose your operator. With this Adaptive mode, if you fail to establish connection, the connection mode is automatically changed to the Auto mode.
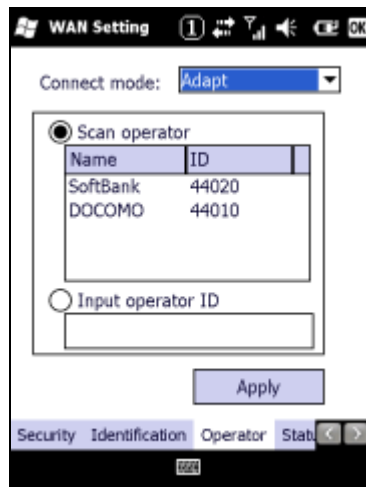
Figure 3-94

Step 4: Create a new connection using the WAN Settings tool

1. On the WAN Settings screen, select **Network Entry** tab.
2. Specify a connection name in the **ENTRY** edit box.
3. Specify the Access Point Name in the **Service Provider (APN)** edit box.
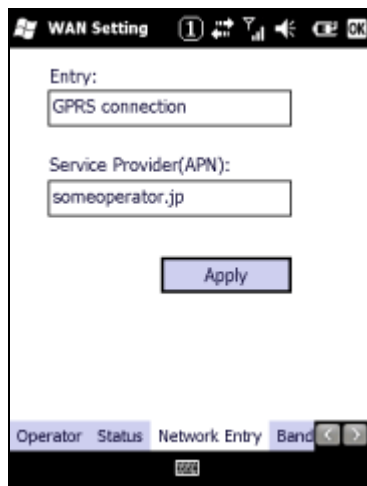
Figure 3-95

4. Tap **Apply** button.
5. Tap **ok** to exit the WAN Settings.

Step 5: Edit the connection settings using the Connections tool.

1. Navigate to **Start** → **Settings** → **Connections** tab and then double tap **Connections** icon.
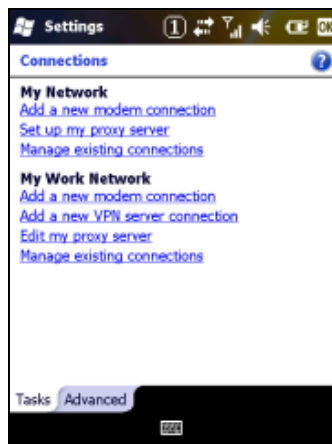
Figure 3-96

2. Under **My Network**, tap **Manage existing connections**. The connection name specified in step 4 appears.

Figure 3-97

3. Tap **Edit...** button. The screen shown below appears.

Figure 3-98

4. Tap **Next**. The screen shown below appears.

Figure 3-99

5. Tap **Next**. The screen shown below appears.

Figure 3-100

6. Specify **User name**, **Password**, and **Domain** if required by the service provider.
7. Tap **Advanced** button. The screen shown below appears.
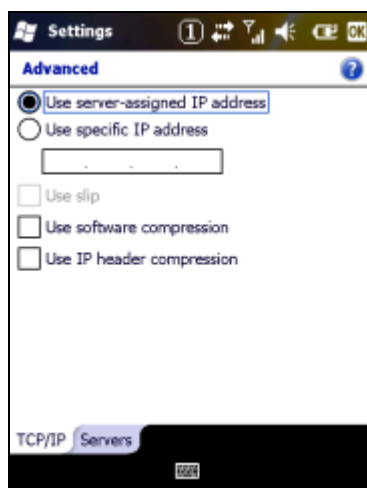
Figure 3-101

8. Check **Use specific IP address** checkbox and set IP address if required by the service provider.
9. Tap **Servers** tab. The screen shown below appears.
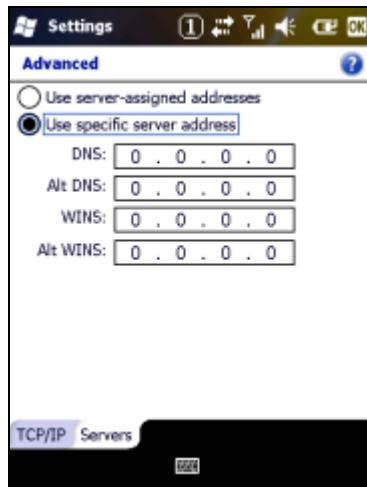
Figure 3-102

10. Check **Use specific server address** checkbox and set IP addresses if required by the service provider.
11. Tap **ok** to return.
12. Tap **Finish**.

Step 6: Establish GPRS connection using the Connections tool

1. Navigate to **Start → Settings → Connections** tab and then double tap **Connections** icon.
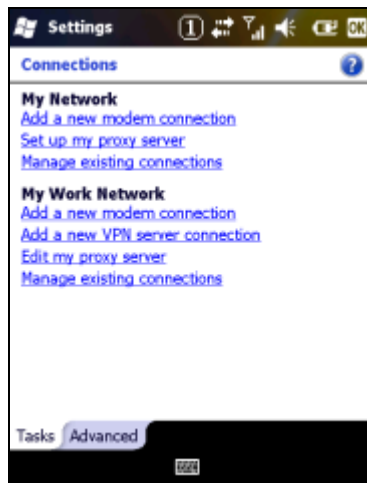
Figure 3-103

2. Under **My Network**, tap **Manage existing connections**. The connection name entered in step 4 appears.

3. Tap and hold the connection name until a popup menu appears. Select **Connect**.

Figure 3-104

4. When the connection is established, the ![icon] icon in the title bar changes to the ![icon] icon. To confirm the status of the connection, tap the ![icon] icon. A balloon window shown as below appears. Now you can communicate with the operator via TCP/IP.
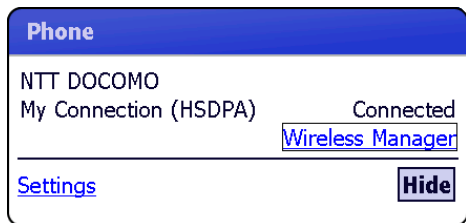
Figure 3-105

3.34 Wireless Manager

This applet is for enabling, disabling, and configuring all the wireless capabilities.

Figure 3-106

3.35 Wireless Configuration

This applet is used to configure wireless networks.

Wireless Tab

Figure 3-107

Network Adapters Tab

This tab is used to configure network adapters.
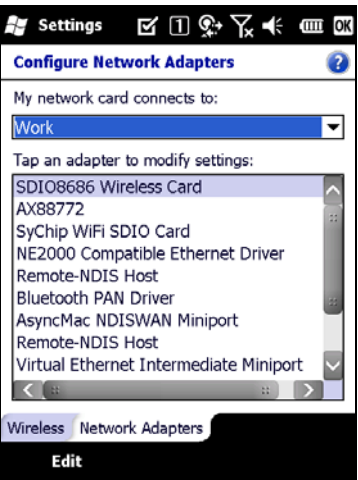
Figure 3-108

Note:

In some cases, this tab appears as the "**Network Cards**" applet.

3.36 WLAN Power

This applet is to set up the settings for power to the integrated WLAN module and to display the detected status of the power.

Figure 3-109

WLAN Power Enable

Check this box to supply the power to the integrated WLAN module.

3.37 WLAN Settings

This applet is to set up the parameters for WLAN configuration.

The **WLANConfig** setting tool starts up by displaying the WLAN settings stored in the **ini** file if it exists in the terminal, or the default WLAN settings if the file does not exist, and then displays **IP** tab.

IP Tab
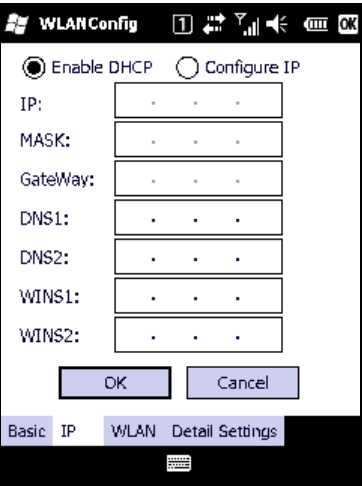
Figure 3-110

Basic Tab

This tab sets up SSID and Security. Click the radio button of Authentication to set "Open" for WEP. Choose either 128 bit radio button or 64 bit radio button for Key Length. For Key Index, up to four kinds of key can be registered.

Figure 3-111

Search Button

This button invokes the **NetSearch** utility.

Security, Authentication

Choose one of the four radio buttons in the **Security** field. By clicking **WPA** or **WPA2** radio button, authentication in either **PSK**, **EAP-PEAP**, or **EAP-TLS** can be set up. If **PSK** is selected in **Authentication**, input a key in the **Key** field to register.
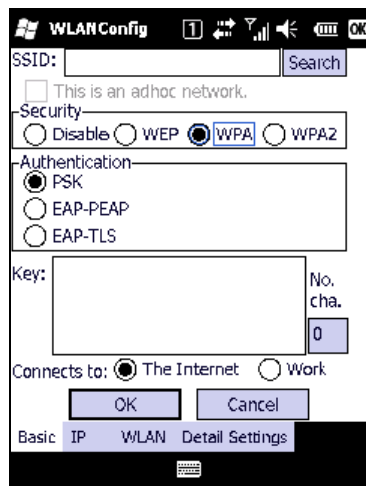
Figure 3-112

If **EAP-PEAP** or **EAP-TLS** is selected, user name, domain validate server, and etc. can be set up.
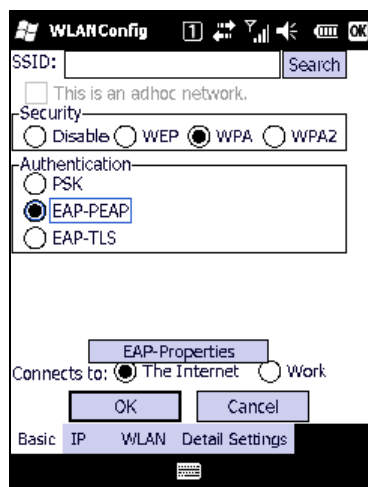
Figure 3-113

WLAN Tab

This tab sets up the basic WLAN settings such as power to the WLAN module, power save mode, WLAN standard, and the threshold level (RSSI level) of roaming.
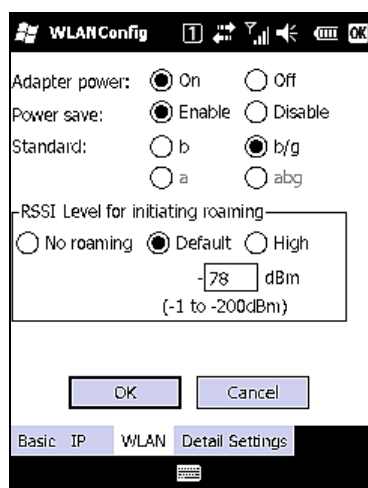
Figure 3-114

Detail Settings Tab

This tab sets up the detailed settings. It sets up whether or not to show popup window when WLAN is not connected to a network. AdHoc connection, all security settings and a comment for the configuration file ("ini" file) can also be set up. For **Advance Settings** and **Version** buttons, refer to the explanation below.
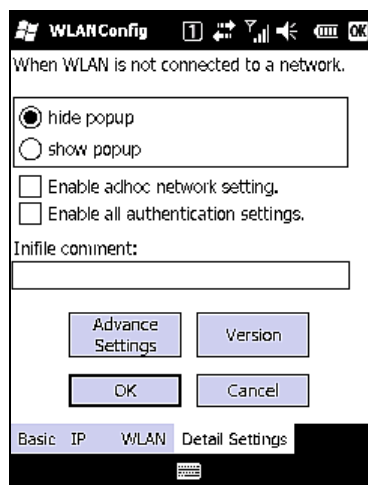
Figure 3-115

Advance Settings Button

This button displays a window of **Advance Settings**. The window sets up frequency channels from nos. 1 to 13 (see note) used in WLAN operation and detailed settings for roaming.
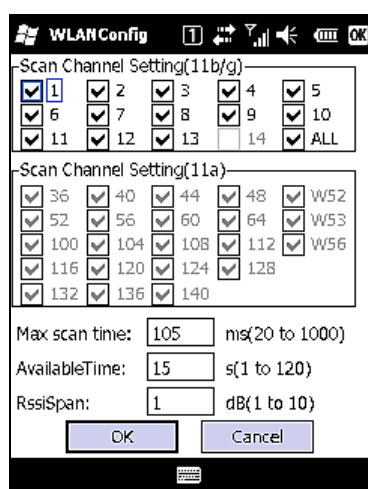
Figure 3-116

Note:
The relevant European standard ("ETSI") limits the number of channels to 13 only.

Version Button

This button displays version information about the application currently running.
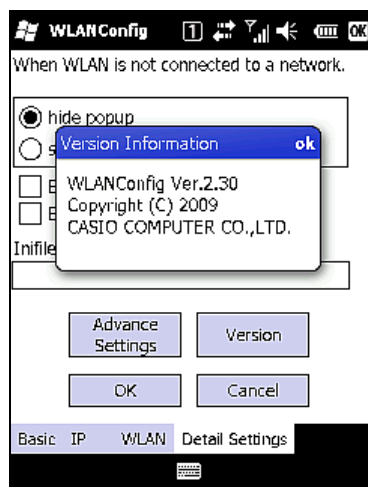
Figure 3-117

If **ok** button in Figure 3.117 is clicked, following "Inifile Save Options" screen appears. This screen is to save the settings you made on each tab of **Basic**, **IP**, **WLAN**, and **Detail** of the WLANConfig tool. Clicking **OK** button saves the settings made on the four tabs to the ini file, and then starts up the terminal to run in WLAN operation. Or, clicking **Cancel** button saves the settings to the ini file, but does not start up the terminal. The settings do not become effect until when a reset on the terminal is performed a next time.
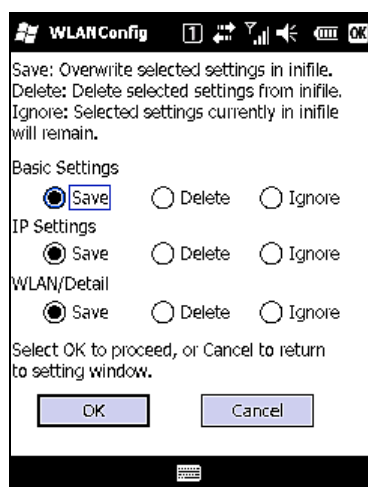
Figure 3-118

4. Application Programs

Once an application program is launched by navigating to **Start → Programs** menu, the application's operation menu is displayed to continue the process.
The following are the application programs implemented in the terminal

Table 4.1

	Name	Description	CASIO	MS
	Today	Default screen	--	Yes
	Games	Solitaire and Bubble Breaker	--	Yes
	ActiveSync	ActiveSync client	--	Yes
	Backup Tool	Backs up and restores user data to/from FlashDisk.	Yes	--
	Calculator	Nine-digit calculator	--	Yes
	Calendar	Personal appointment management tool	--	Yes
	Contacts	Personal contact management tool	--	Yes
	Copy Devices	Copies user data between two terminals.	Yes	--
	Display Demo	This application is display some different pattern LCD Display	Yes	--
	E-Mail(Messaging)	Electronic mail client	--	Yes
	File Explorer	File management program	--	Yes
	FLCE	Client for data upload and download	Yes	--
	Getting Started	Shortcut menus for setting up the terminal	--	Yes
	GPS Information	Positioning information	Yes	--
	Image Scanner Demo	Demonstrates the features of scanning bar codes.	Yes	--
	Image Scanner Read	Scans bar codes.	Yes	--
	Internet Explorer	Displays web pages for Internet and Intranet.	--	Yes

Continue.

	Internet Sharing	This application enables your PC to use the terminal as a modem for connecting to the Internet.	--	Yes
	LogViewer	The Logging Tool is a tool that the SE uses to analyze causes when a fault occurs.	Yes	--
	Messenger	Windows Live Messenger	--	Yes
	Mobile Camera	Captures and displays static images. (See Picture&Videos)	Yes	--
	MoUpdate	Module update module	Yes	--
	NetSearch	Displays a list of partners via WLAN.	Yes	--
	NFC Demo	Various demos related to scanning NFC cards are performed.	Yes	--
	Notes	Takes a quick note.	--	Yes
	Notification Demo (Buzzer / Vibration)	This application is sound some different pattern buzzer and vibration	Yes	--
	Phone	his application enables you to mobile phone	--	Yes
	Pictures & Videos	Shows digital pictures and videos.	--	Yes
	Printer Demo	Printer demo	Yes	--
	Remote Desktop Mobile	Remote desktop client.	--	Yes
	Task Manager	Displays running programs.	--	Yes
	Tasks	Personal task management tool	--	Yes
	Windows Live	Windows Live client	--	Yes
	Windows Media	Windows Media Player	--	Yes
	WLAN Barcode Setting	WLAN Barcode Setting	Yes	--

MS; Microsoft

4.1 Today

When you turn on the terminal for the first time each day, you will see the Today screen. You can also display it by tapping the Today's icon. On the Today screen, you can see important information at a glance for the day.

<Classic>   <Professional>

Figure 4-1

4.2 Games

The terminal comes with two games; Solitaire and Bubble Breaker.

Figure 4-2

4.3   ActiveSync

This application is an ActiveSync client program for the terminal to communicate with PC.
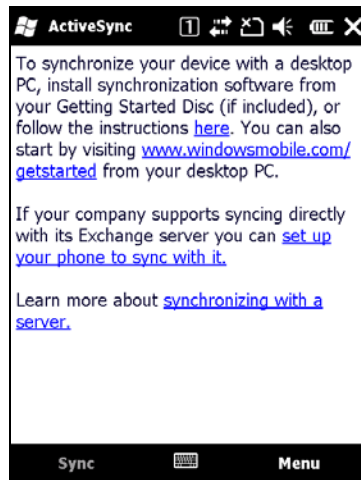
Figure 4-3

4.4 Backup Tool

This tool backs up user's data into the memory card and then restores it to deploy the backed up data in the terminal.

Applicable data for backup and restoration with the tool
- Files on the FlashDisk (except OS components)
- Registry
- Received mails
- Cookie of browser and temporally files
- Certificates

Note:
Changed sizes of the memory area, password and stylus correction related information are not backed up.

Medium to restore data;
Memory card (micro SD, …), FlashDisk folder of the device

Password for Back Up Process

For security purpose, a password can be set which is required at a time of starting up the backup process. This password does not allow backed up data in memory card to be restored unless it is correctly entered when the restoration is initiated.
Note that the password does not also allow automatic restoration with the automatic backup tool if password has been set.

Backup Process

1. Navigate to **Programs** → **Utility** and then double click **Backup Tool** icon. The screen appears. Choose a memory card in the pull-down menu and click **Backup now** button.
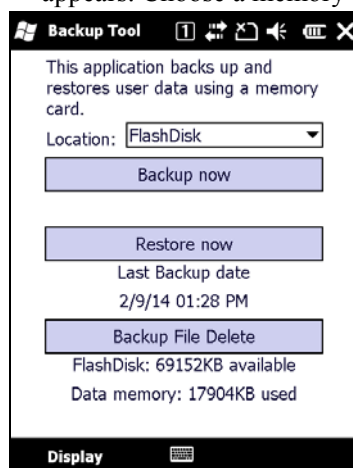
Figure 4-4

2. If you require a password to set in the screen appeared after clicking **Backup now** button, enter a password in **Password** field and then press F3 key (= Tab key) to confirm. Enter the same password in **Confirm Password** field and then press F2 key (= Back Tab keys). Click **Yes** button to complete the entering of password. Otherwise **No** button to return to the previous screen.

3. If you choose **Yes** button in the step above, **Backup in Progress** screen appears and the backup process is initiated. While the backup continues, do not operate any key on the keyboard or on the right and left sides.
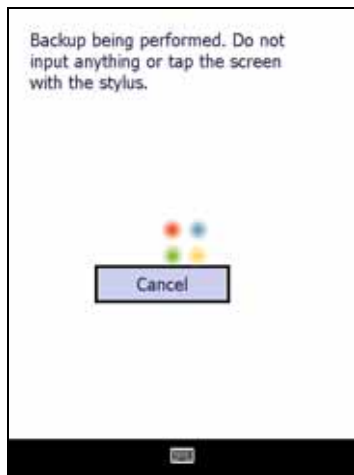
Figure 4-5

4. When the backup is complete, a buzzer sounds in a short period indicating the completion. Click **ok** button in the popup message screen.
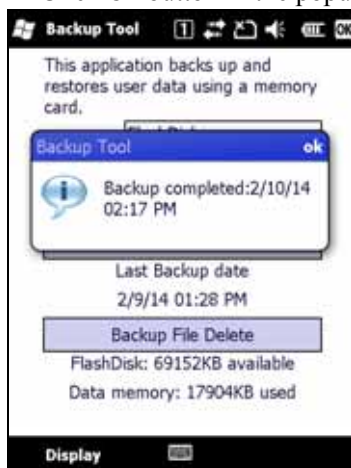
Figure 4-6

Restoration Process

1. Press **Restore now** button.
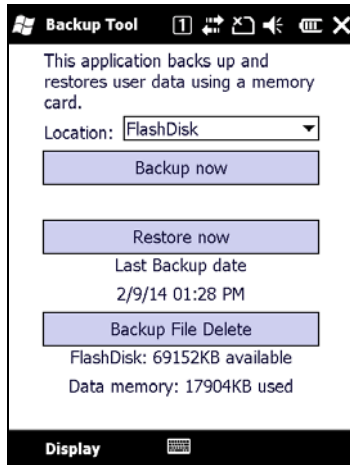
Figure 4-7

2. Enter the same password in **Password** field if it has been set up at a time of the backup process and click **Yes** button. Or, click **No** button to return to the previous screen.
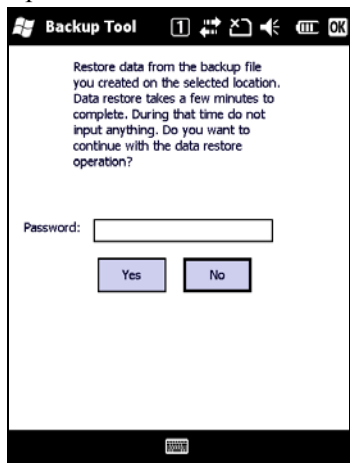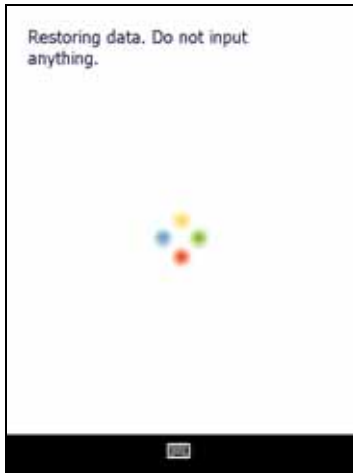
Figure 4-8

3. If you choose **Yes** button in Figure 4.8, **Restore in Progress** dialogue screen appears indicating the initiation of restoration. While this screen is being appeared, do not operate any key on the keyboard or on the right and left sides.

Figure 4-9

4. When the restoration is complete, a buzzer sounds in a short period indicating the completion. Click **ok** button in the popup message screen and **X** button at upper-right corner in the screen to close the tool.
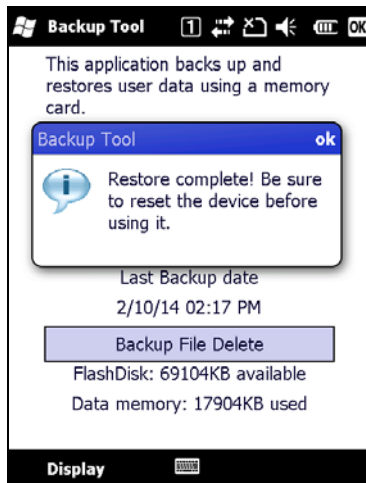

Figure 4-10

Initiating the Tool at Command Line

The following explains how to initiate the backup tool at command line.

```
CF_Backup.exe <option> <target> [<password>]
```

Parameters in the command line;

option
/B: Specify the backup process.
/R: Specify the restoration process.

In the <option> field, specify either /B or /R. Character of the selection to enter is not case-sensitive.

target
Storage directory of backup file

password
A password to set up if required.

Notes:
- Depending on the size of data to back up or to restore, it may take a few ten seconds to a few minutes.
- To carry out the backup and restoration processes, it is recommended to use the dedicated AC Adaptor (AD-S42120C) connected directly to the terminal or via cradle to power the terminal.

Troubleshooting

Table 4.2   Error messages

Process	Error message	Cause
Backup	Memory backup was cancelled because no storage card is loaded or because of insufficient storage card capacity. Correct the problem and try again.	There should be a file still kept being opened.
	An error occurred while writing the backup file to card. Return to the menu, delete the backup file that was created, and try again.	Due to insufficient memory capacity, temporary file of the backup file cannot be saved in mid-course.
	Memory backup was cancelled due to low battery power! Replace batteries and try it again.	Due to low battery power, the backup file cannot be saved.
Restoration	Restore failed because the data file could not be written.	Due to insufficient memory capacity, temporary file of the backup file and the backup file cannot be exchanged.
	Restore failed because the backup file could not be read.	Backup file cannot be read due to the corruption of the file.
	Restore was cancelled due to low battery power! Replace batteries and try it again.	Due to low battery power, the backup file cannot be read.
	The password was not correctly confirmed. Be sure that the confirmation password exactly matches the password.	The password entered does not match to the password created in the backup process.

4.5 Calculator

The application can be used to operate nine-digit calculator.

Figure 4-11

4.6 Calendar

Calendar is a program that helps you manage your schedule. Appointments and meetings in the Calendar can be viewed using a variety of different formats, and you can set alarms to notify you upcoming appointment times.
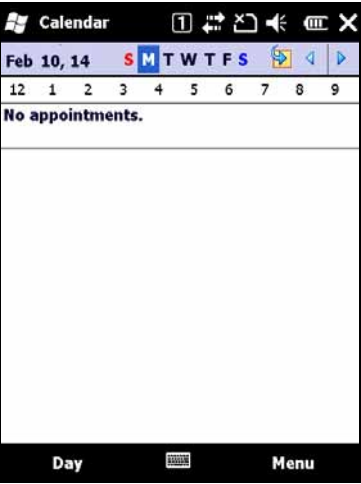

Figure 4-12

To create a new Appointment, navigate to **Menu → New Appointment**.

See Table 4.3 for menus of the application.

Table 4.3   Menus in the application

Menu			Description
Day			Switches to the Day view.
Week			Switches to the Day view.
Month			Switches to the Week view.
Year			Switches to the Month view.
Agenda			Switches to the Agenda view.
Menu			
	New Appointment		Creates a new Appointment.
	Beam Appointment ...		Sends the selected Appointment via Bluetooth.
	Delete Appointment		Deletes the selected Appointment.
	Reply		
		Reply	Replies the meeting notice.
		Reply All	Replies the meeting notice to all attendees.
	Go to Today		Displays the Appointments of today.
	Go to Date		Displays the Appointments of specified day.
	Edit		
		Cut	Cuts the selected Appointment.
		Copy	Copies the selected Appointment.
		Paste	Pastes the Appointment that are cut or copied.
	Tool		
		Options ...	Sets up options for Appointment.
	View		
		Agenda	Switches to the Agenda view.
		Day	Switches to the Day view.
		Week	Switches to the Week view.
		Month	Switches to the Month view.
		Year	Switches to the Year view.
	Filter		
		All Appointments	Displays all Appointments.
		No Categories	Displays all Appointments with no category.

4.7 Contacts

Use Contacts to store and manage the names, addresses, phone numbers, and email addresses of friends, co-workers, customers, etc.
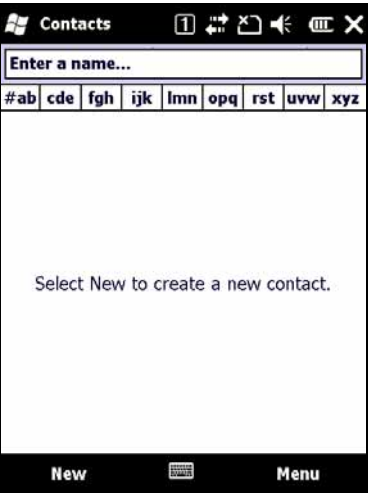

Figure 4-13

To create a new Contact, tap **New**.

To find a contact, do one of the following:

- Begin entering a name in the provided text box until the contact you want is displayed.
- Use the alphabetical index displayed at the top of the contact list.
- Filter the list by category. In the contact list, navigate to **Menu** → **Filter**.

Table 4.4   Menus in the application

Menu			Description
New			Creates a new Contact.
Menu			
	Edit		Edits the selected Contact.
	Send Contact		
		Beam	Sends the selected Contact via Bluetooth.
	Copy Contact		Copies the selected Contact.
	Delete Contact		Deletes the selected Contact.
	Options ...		Sets up options for Contact.
	View By		
		Name	Displays contact list sorted by name.
		Company	Displays contact list sorted by company.
	Filter		
		All Contacts	Displays all Contacts.
		Recently Viewed	Displays Contacts you have recently added, edited, or viewed.
		No Categories	Displays all Contacts with no category.
	Select Contacts		
		Several	Select several Contacts.
		All	Select all Contacts.

4.8   Copy Devices

The machine on which the application is installed and settings have been made is the parent terminal, and same content as on the parent terminal is duplicated (overwrite copy) to the child terminals. The time settings on the child terminals are synchronized with the parent terminal.

Sent content
Table 4-12-1

Target	Content	Remarks
FlashDisk	All files in the FlashDisk.	

* To make both the parent terminal and child terminals in the mirror state, the content of the child terminals and the FlashDisk must be cleared prior to copying between terminals.

Procedure for copying between terminals
The procedure for copying between terminals is as follows:

Parent terminal side
5.   Specify the target to send to, and start transmission

Select "2. Sender Mode"
on the Start screen.

Enter the group name. If
you do not want to divide
groups, select "Start"
without entering anything.

Parent Terminal mode
starts and the Child
Terminal Search screen is
displayed. Select "Close"
to terminate the process.
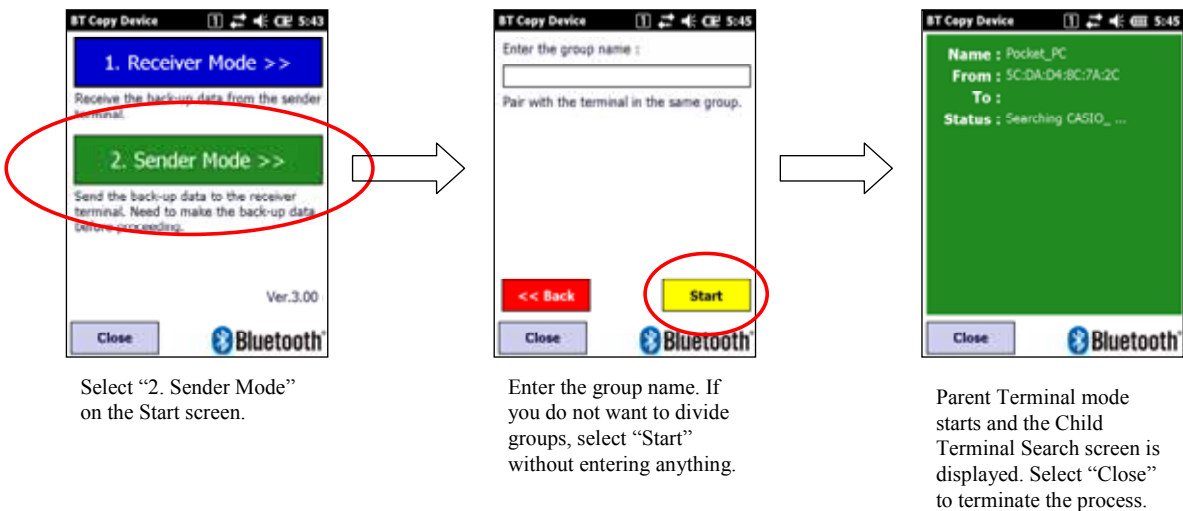
Figure 4-1

Data transmission starts when the child terminals are discovered.

Child terminal side

6. Start reception

Select "1. Receiver Mode" on the Start screen.

Select "1. Normal Copy" on the Selection screen.

Enter the group name. If you do not want to divide groups, select "Start" without entering anything.

Child Terminal mode starts. Select "Close" to terminate the process.
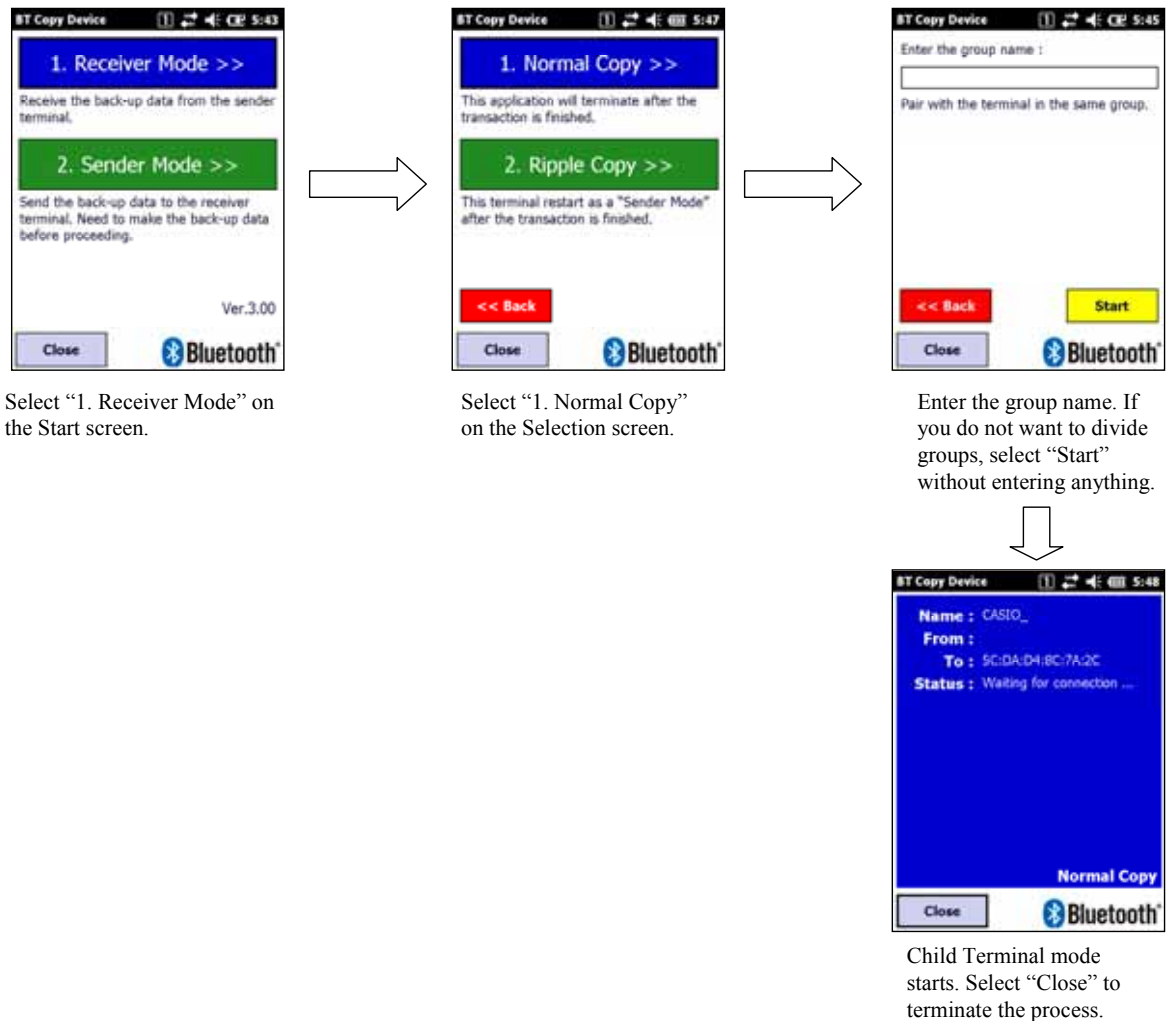
Figure 4-2

Stand by for connection from the parent terminal. Data transmission starts when the connection is completed.

CAUTION
- When Bluetooth is used for communication, the number of terminals involved in parent-child communications is limited within a given space, because all terminals share the same bandwidth. As a guideline, up to five pairs can communicate.
- Make sure all parent and child terminals have adequate battery level when communicating. If power is cut off due to insufficient battery level during communication, a communications error will occur.
- When a communications error occurs for any reason, processing resumes, starting with the parent terminal searching for child terminals, and the child terminals standing by for connection from the parent terminal.
- The MD5 checksum for each sent file is used to check integrity. When corruption is confirmed, processing resumes, starting with the parent terminal searching for child terminals, and the child terminals standing by for connection from the parent terminal.

- The child terminal changes the terminal name before communicating. When the reset on the rear is used in this state, the terminal name stays as the changed name from the next reboot. If the rear reset was used, it is necessary to use user disk clear to return to the default state, or reset the terminal name manually.

4.9 Display Demo

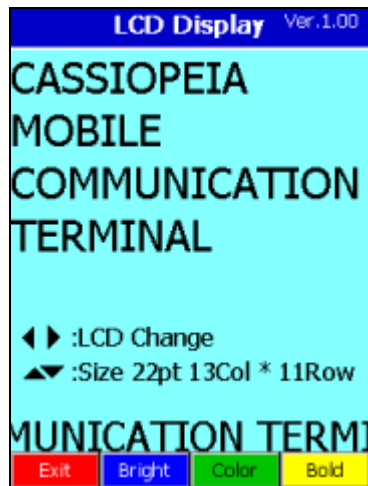This application is display some different pattern LCD Display.

Figure 4-14

4.10 File Explorer

This application is a file management program. It can copy files, transmit files, delete files, create folders and delete folders.

Figure 4-15

Table 4.5   Menus in the application

Menu			Description
Up			Opens the parent folder.
Menu			
	Go To		
		My Documents	Opens the My Documents folder.
		My Device	Opens the root folder.
		Folders ...	Opens the upper folder.
		Open Path	Opens the network share.
	Refresh		Updates the list with latest information.
	Show All Files		Displays all files.
	Sort By		
		Name	Displays the list sorted by name.
		date	Displays the list sorted by date.
		Size	Displays the list sorted by size.
		Type	Displays the list sorted by file type.
	Send ...		Creates a new e-mail message with the selected file attached.
	Beam File ...		Sends the selected file via Bluetooth.
	New Folder		Creates a new folder.
	Rename		Changes the specified file and folder names.
	Delete		Deletes the specified file and folder.
	Edit		
		Undo	Returns to the previous operation.
		Cut	Cuts the selected file and folder.
		Copy	Copies the selected file and folder.
		Paste	Pastes the file and folder that are cut or copied.
		Paste Shortcut	Creates a shortcut for the file and folder that are cut or copied.
		Select All	Chooses all the files and folders that are displayed.

4.11 FLCE

This application enables the terminal to communicate with a PC with the LMWIN utility being running. The communication between the terminal and the PC is established via cradle.

Input Command Line Screen

Figure 4-16

Screen During Transmission

While the communication continues, the following screen will appear. Refer to LMWIN Utility Manual available separately for detail of the operation.
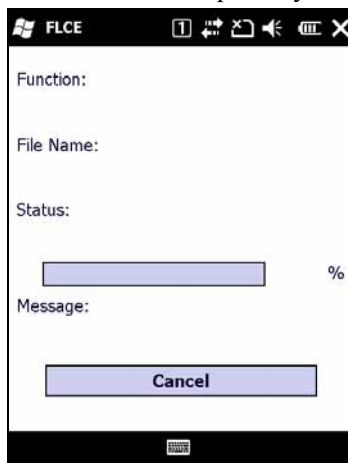

Figure 4-17

4.12 Getting Started

This application displays shortcut menus for setting up the terminal.

Figure 4-18

4.13 GPS Information

This application is for Windows Mobile Professional version.
This application displays the positioning information and satellite information retrieved by the GPS module integrated in the terminal (model dependant).

GPS module power is related with phone function, therefore when you use this GPS Information, please check Phone power condition in Wireless Manager is On status.
(Default setting is On.)

Figure 4-19
(GPS Unit Power ON condition)
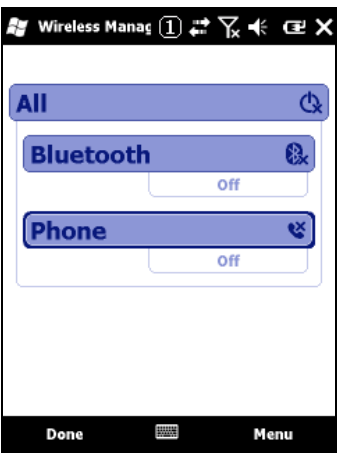
Figure 4-20
(GPS Unit Power OFF condition)

Status Tab

This tab displays the information of the satellite from which the signal is being received.
If GPS information do not display after execute this program, please wait until receive satellite information (within about one to five minutes) at outside of sight good location.
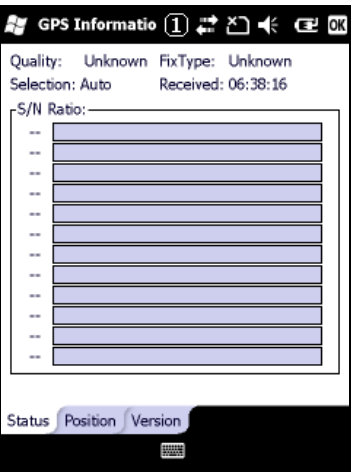
Figure 4-21

Quality

This displays the object subject to positioning. "GPS" is displayed if the power to the GPS module is on.

Selection

"Auto" is displayed if the power to the GPS module is on.

FixType

This displays the reliability of the positioning data. Either "3D", "2D" or "- " is shown which means either three or two-dimensional positioning or that positioning is not possible.

Received

This displays the time of the most recent GPS positioning.

S/N Radio

The satellite number is shown on the left while the intensity of that satellite's signal is indicated in the bar. The stronger the signal is, the further the bar moves towards the right edge of the screen.

Position Tab

This tab displays the position of the satellite from which the signal is being received.
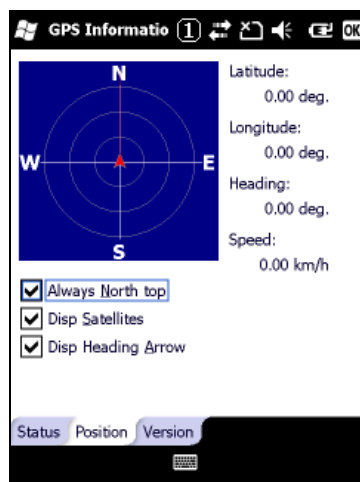
Figure 4-22

Latitude

This displays the latitude of the positioning results.

Longitude

This displays the longitude of the positioning results.

Heading

This displays the traveling direction of the positioning results.

Speed

This displays the traveling speed of the positioning results.

Always North top

In the Check mode, the displayed direction is always shown with north on top. When the Check mode is turned off, the traveling direction is shown on top.

Disp Satellites

In the Check mode, the satellite position is displayed as a white circle containing the satellite's number. When the Check mode is turned off, the satellite position is not displayed.

Disp Heading Arrow

The traveling direction is displayed as a red arrow in the Check mode. When the Check mode is turned off, the red arrow is not displayed.
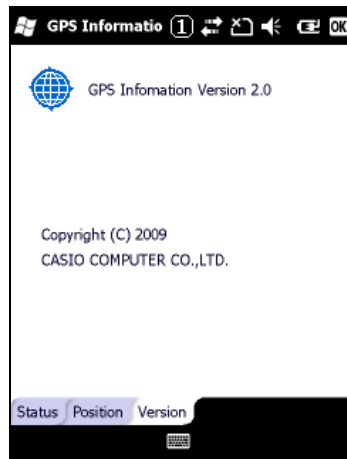
Version information

Figure 4-23

A-GPS function setting

If your using SIM Card contract with telephone company is supported A-GPS function, you can set A-GPS setting as below. (About setting detail, please follow telephone company indications.)

Change setting detail of "GPSdef.ini" file in Windows folder.

```
Setting detail
[GPS]
SettingEditor=1            <= Change this value from 0 to 1
```

The following setting tab menu will be appeared after execute GPS information program.
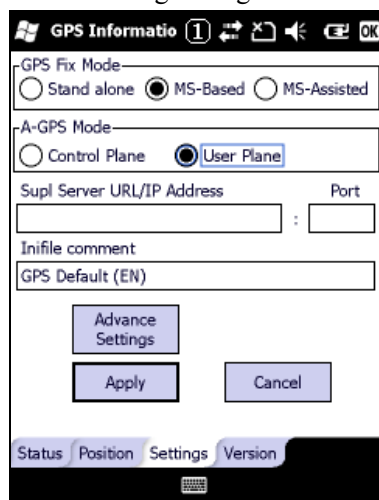
Figure 4-24

No.	Item	Operation
1	GPS Fix Mode	Select A-GPS operation mode. • Stand alone : Without A-GPS • MS-Based : MS-Based mode • MS-Assisted : MS-Assisted mode
2	A-GPS Mode	Select A-GPS execution method. • Control Plane : Control Plane mode • User Plane : User Plane mode Note : When you select "MS-Based" or "MS-Assisted" in GPS Fix Mode, this setting item will be appeared.
3	Supl Server URL/ IP Address	Specify URL or IP address for connection to Supl server. - When you select "User Plane" in A-GPS Mode, this setting is available. - Available to set until 110 byte - Error if no setting
4	Port	Specify Port number for connection to Supl server - When you select "User Plane" in A-GPS Mode, this setting is available. - Available to set from 0 to 65535. - Available to skip - Error if value is out range.
5	Inifile comment	Specify comment to write into ini file. - Available to set until 100 byte. - Available to skip
6	Advance Settings	Display Accuracy value (Satellite receive threshold value of GPS running) setting menu. - Specify decimal number over 0 (x => 0). - Error if no setting or under 0 value.
7	Apply	Setting value will be available.
8	Cancel	Exit this program.
	[OK] button	Exit this program.

4.14 Image Scanner Demo

This Aplication is Image Scanner read Demonstration.
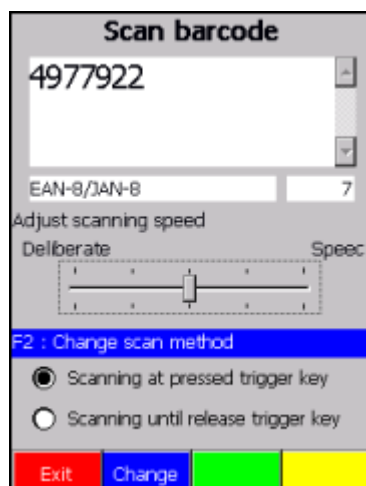
Figure 4-25

Scan barcode

Figure 4-26

Display scanning barcode data. At this time, you can change the following setting.

- Adjust scanning speed
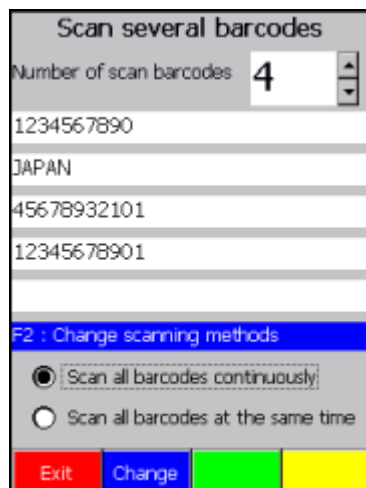- Change scan method

Scan several barcodes

Figure 4-27

You can scan several barcodes continuously or at the same time.
And scanned data will be displayed in this screen.
Scanning barcode number range is from 2 to 5.
When you press trigger key, before scanned data will be cleared.

Capture image

Figure 4-28

Display capture image data by pressing trigger key and Pre-view will be started again by pressing trigger key.

Scan target barcode
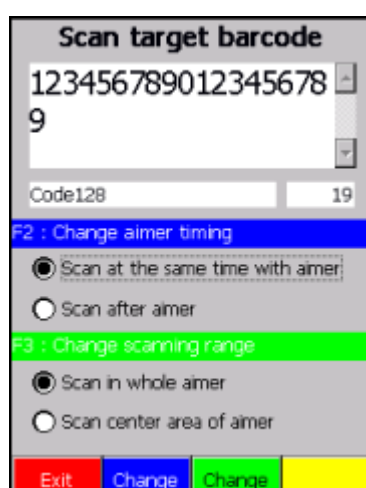
Figure 4-29

Display scanning barcode data. At this time, you can change the following setting.

- Change aimer timing
- Change scanning range

Challenge scanning speed
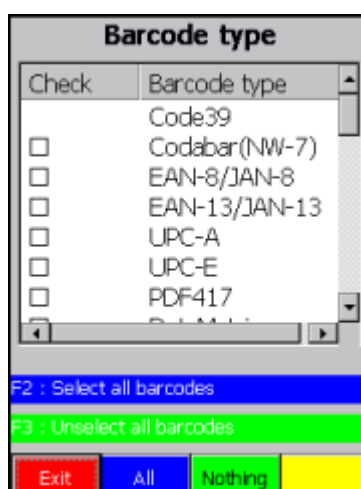
Figure 4-30   Figure 4-31

Scan same barcode continuously, then display scanning times and periods.
Maximum scanning period is 10 seconds.
Default available barcode setting is below.

- Codabar(NW-7)
- EAN8 / EAN13
- UPCA / UPCE
- PDF417
- DataMatrix
- Chinese Sensible Code

For confirming high scanning performance, we would like to recommend to set only scanning barcode type.

Setting

Figure 4-32

This setting will be available in all scanning demonstration except "Challenge scanning speed" demo. This demo is set vibration function is off for keeping high performance.

4.15 Image Scanner Read

After scanning 1D bar code symbol or 2D code symbol with the integrated Imager, a result of the scanning is output to application. The output method as well as other relevant parameters for scanning can be determined by the settings made in "Imager Setting". To display the **Settings** menu, tap the (⬙) icon in the taskbar and then choose **Settings**.

Operation Procedures

1. Navigate to **Start → Programs → Image Scanner Read** icon. As soon as the icon is tapped, it appears in the taskbar indicating that the application is being started up.
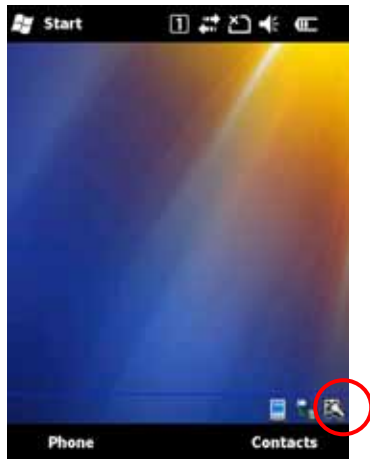

Figure 4-33

2. Start up an application that receives a result of scanning 1D bar code or 2D code symbol.
3. Scanning 1D bar code or 2D code symbol takes place when one of the Trigger keys is pressed.
4. The scanning ends when the Trigger key is released or when the preset timeout elapses.
5. The scanning result is output to the application.

Notes:
- To exit the image scanning application, tap the (⬙) icon in the taskbar and then choose **Close** menu.
- The clipboard output method copies data of scanning 1D bar code/2D code symbol into the clipboard by pasting it (by executing the keyboard event (Ctrl and V keys)). Therefore, data of scanning cannot be output to application that does not support the paste operation (the keyboard event (Ctrl and V keys)).
- These image scanning applications cannot run simultaneously with other application that occupies the integrated imager.

4.16 Internet Explorer

This application displays web pages on the Internet and Intranet.

Figure 4-34

Table 4.6   Menus in the application

Menu			Description
Favorites			Displays the Favorites menu.
Menu			
	Favorites		Displays the Favorites menu.
	Add to Favorites		Adds the current page to the Favorites menu.
	Go to Web Address		Focuses on the Address Bar.
	Zoom Out		Displays the current page smaller.
	Home Page		Returns to the homepage.
	History		Changes the display to a page listed in the history.
	Forward		Changes the display to the previous page displayed prior to returning.
	Refresh		Updates the current page to the latest information.
	View		
		Text Size	Specifies the displayed font size.
		Full Screen	Hides the main menu, toolbar, etc.
		Mobile	Changes the displayed page size to reduction mode.
		Desktop	Keeps the same layout and size as on a desktop computer.
	Tools		
		Send Link	Creates a new e-mail message with a link to the current page.
		Properties	Displays the property of page.
		Option	Sets up options for security, etc.
	Copy/Paste		
		Make Selection	Starts text selection mode.
		Paste	Pastes text that are cut or copied.

4.17 Internet Sharing

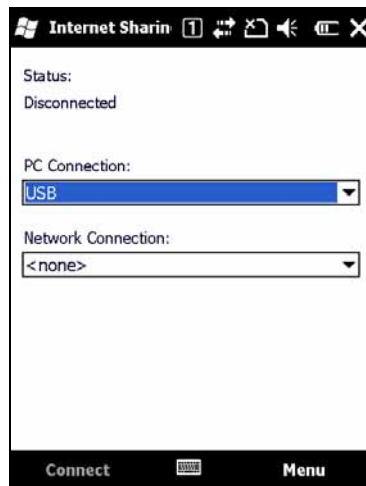This application enables your PC to use the terminal as a modem for connecting to the Internet.

Figure 4-35

If your terminal has a data connection plan, your PC can use the terminal to connect to the Internet.

To use the terminal as a modem using a USB cable, follow the steps below.
1. On your PC, open **ActiveSync**, and navigate to **File** → **Connection Settings**.
2. Clear the **Allow USB connections** checkbox.

3. Connect the terminal to the PC using a USB cable.
4. On the terminal, navigate to **Start** → **Programs** → **Internet Sharing**.
5. Select **USB** in the **PC connection** pull-down menu.
6. Select the **Network connection** that the terminal should use to connect to the Internet.
7. Tap **Connect**. Allow approximately 30 seconds for the connection to be established.

4.18 Messaging

This application sends and receives electronic mail that supports the POP3 or IMAP4.

Figure 4-36

To set up a new account, see "**Setting Up e-mail Account**".
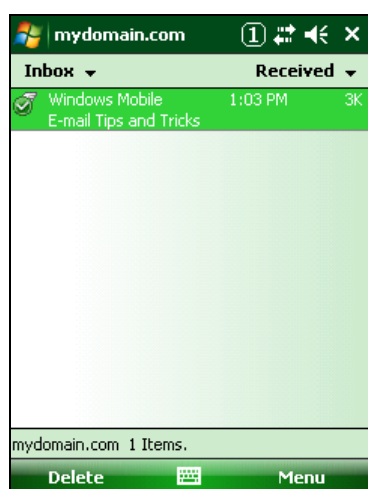
Message List Screen

Figure 4-37

Table 4.7   Menus in the Message List Screen

Menu			Description
Delete			Deletes the selected message.
Menu			
	New		Creates a new message.
	Reply		
		Reply	Replies to the selected message.
		Reply All	Replies to sender and CC'ed recipients of the selected message.
		Forward	Forwards the selected message.
	Mark as Read		Marks the selected message as read.
	Move ...		Moves the selected message to other folder.
	Go to		
		Folders ...	Changes current folder.
	Tools		
		Sort By	Changes sort order of the message list.
		Message Type	Displays message list sorted by message type.
		From	Displays message list sorted by sender's address.
		Received	Displays message list sorted by received date.
		Subject	Displays message list sorted by subject.
		Manage Folders ...	Creates or modifies folders.
		Empty Deleted Items	Empties the Deleted Items folder.
		Clear	Deletes all messages in Inbox.
		New Account ...	Creates new account.
		Options ...	Sets up options for security, etc.
	Select Message		
		All	Selects all messages.
		All Below	
		Several	Selects several messages.
	Send/Receive		Sends and receives messages.

Viewing Screen
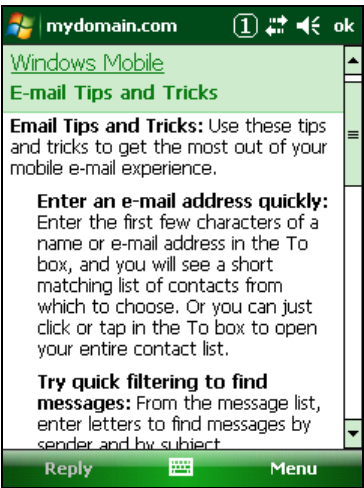
Figure 4-38

Table 4.8　Menus in the Viewing Screen

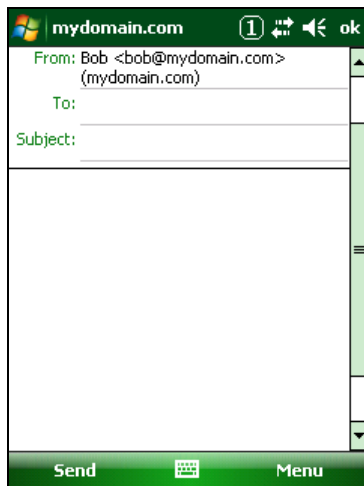| Menu			Description
Reply			Replies to the message.
Menu			
	Delete		Deletes the message.
	Reply		
		Reply	Replies to the message.
		Reply All	Replies to sender and CC'ed recipients of the message.
		Forward	Forwards the message.
	Mark as Unread		Marks the message as unread.
	Move ...		Moves the message to other folder.
	View		
		Text Size	Changes the text size.
		Language	Changes the language.
	Download Message		Downloads current message with attachments.
	Send/Receive		Sends and receives messages.

Writing Screen

Figure 4-39

Table 4.9 Menus in the Writing Screen

Menu	Description
Send	Sends the message.
Menu	
Add Recipient ...	Adds another contacts to recipient.
Check Names	Searches for name stored in Contacts.
Insert	
Picture	Inserts a picture into the message as attachment.
Voice Note	Inserts a voice mail into the message as attachment.
File	Inserts a file into the message as attachment.
My Text	Inserts a preset or frequently used phrase.
Save to Draft	Saves the message to Draft folder.
Spell Check	Checks the spelling.
Cancel Message	Cancels the message to Draft folder.
Message Option ...	Sets up options for the message.

Setting Up e-mail Account

To set up an e-mail account, follow the steps below.

1. Navigate to **Setup E-mail** or navigate to **Menu** → **Tool** → **New Account**. The screen shown below appears.

Figure 4-40

2. Enter your **E-mail address** and **Password**.
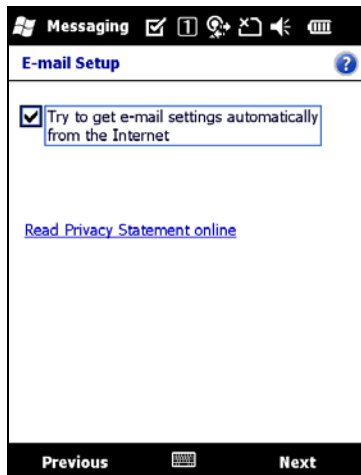3. Tap **Next**. The screen shown below appears.

Figure 4-41

4. To allow Auto configuration to connect to the Internet, obtain e-mail server settings (if possible) and enter this information for you, select **Try to get e-mail settings automatically from the Internet** checkbox.
5. Tap **Next**. Auto configuration attempts to download necessary e-mail server settings, so you do not need to enter them manually.

6. When Auto configuration has finished, tap **Next**. The screen shown below appears.
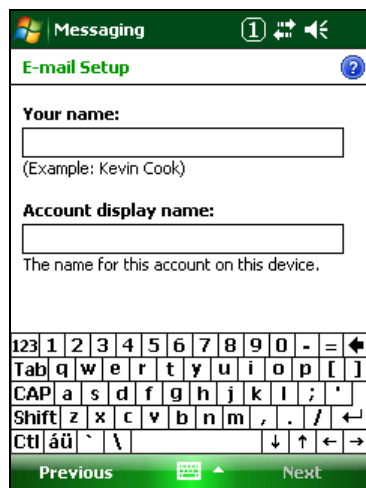

Figure 4-42

7. Enter **Your name** (the name you want displayed when you send e-mail) and **Account display name** that displays in Messaging.
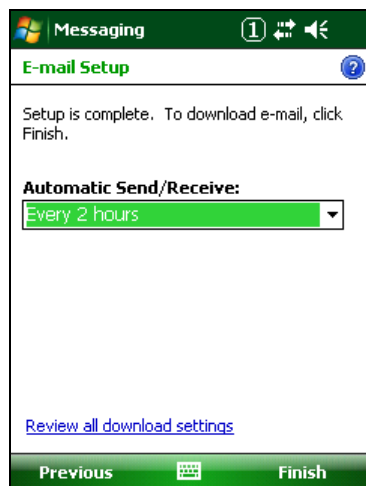8. Tap **Next**. The screen shown below appears.

Figure 4-43

9. Select the intervals for downloading new messages from the **Automatic Send/Receive** pull-down menu.
10. Tap **Finish**.

Before tapping **Finish**, you can tap Options to access additional settings. For example:
- Limit the number of messages that are downloaded.

If Auto configuration is unsuccessful or if you have an account you access using a VPN server connection, contact your ISP or network administrator for the following information and enter it manually:

Table 4.10

Setting	Description
User name	Enter the user name assigned to you by your ISP or network administrator. This is often the first part of your e-mail address, which appears before the at sign (@).
Password	You have the option to save your password, so you do not need to enter it each time you connect to your e-mail server.
Domain	Not required for an account with an ISP. May be required for a work account.
Account type	Select POP3 or IMAP4.
Account name	Enter a unique name for the account, such as Work or Home. This name cannot be changed later.
Incoming mail server	Enter the name of your e-mail server (POP3 or IMAP4).
Outgoing mail server	Enter the name of your outgoing e-mail server (SMTP).
Require SSL connection	Select this to ensure you always receive e-mail for this account using an SSL connection. This enables you to receive personal information more securely. Please note that if you select this and your ISP does not support an SSL connection, you will not be able to connect to receive e-mail.
Outgoing mail requires authentication	Select this if your outgoing e-mail server (SMTP) requires authentication. Your user name and password from above will be used.
Use separate settings	Select this if your outgoing e-mail server requires a different user name and password than the ones you entered before.
Outgoing server settings:	
User name	Enter your user name for the outgoing e-mail server.
Password	Enter your password for the outgoing e-mail server.
Domain	Enter the domain of the outgoing e-mail server.
Require SSL for outgoing mail	Select this to ensure you always send e-mail from this account using an SSL connection. This enables you to send personal information more securely. Note that if you select this and your ISP does not support an SSL connection, you will not be able to send e-mail.

4.19 Messenger

You can use Windows Live Messenger on the terminal to chat with friends or co-workers.
You must have a Windows Live ID and password to use this service.

Figure 4-44

4.20 Mobile Camera

This application captures static images.

Figure 4-45   Portrait Screen

Figure 4-46   Landscape Screen

The orientation of static image is depending on the screen orientation of the terminal. See "Screen" settings.

Table 4.11   Buttons of the Toolbar at top

Button		Description
☼	Brightness Setting	Opens Brightness Setting screen.
▦	List View	Launches "Pictures & Videos" application.
📂	Folder	Changes the folder to which captured image will be saved.

Table 4.12   Buttons of the Toolbar at left

Button		Description
🔆	LED Flash	LED can be switched to off, 50% or 100% intensity.
✖	Add GPS Data	Choose either "Add" or "Don't Add" to add or omit GPS data.
D⚡	Digital Flash	Switches on or off the digital flash function. The function is to enable a captured object image in darker surrounding to be visible in the screen by composing the image.
±	Exposure compensation (+)	Brightens the exposure.
−	Exposure compensation (-)	Darkens the exposure.
⚏	White balance	Chooses a white balance from "Automatic", "Outdoor", "Under fluorescent lamp" and "Under light bulb".

Table 4.13   Buttons of the Toolbar at right

Button		Description
	Trapezoidal Correction	Changes the trapezoidal correction to "Correct" or "Don't correct".
	Size	Chooses a capture size from "UXGA", "QUADVG", "XGA", "SVGA", "VGA" and "1/4VGA".
	Image quality	Chooses an image quality from "Bitmap", "Fine", "Normal" and "Economy".
	Magnification	Chooses a magnification from "1.0" and "1.5".
	Focus function	Chooses either "Auto", "Close-up" or "Mid-range"
	Focus operation	Pressing the Focus operation button when the Focus function is set to Auto focuses objects appearing in the center of the screen. After the camera is focused, correct the frame and press the shutter button to capture the image. This button cannot be used in Focus function modes other than Auto.
	Shutter button	Press the shutter button to capture the image. If the Focus operation button is not pressed while the Focus function is set to Auto, it is performed after the image is captured.

4.21 NetSearch

This application displays a list of partner stations communicable with the terminal via WLAN.

- Partner stations on the list can be sorted in the order of field intensity, station name and channel.
- Field intensity for the partner station currently being established with the terminal is displayed in green.
- The information appeared in the screen is updated every five seconds.
- The remote station's WLAN standard IEEE802.11 b/g icon is displayed at the head of the station name.
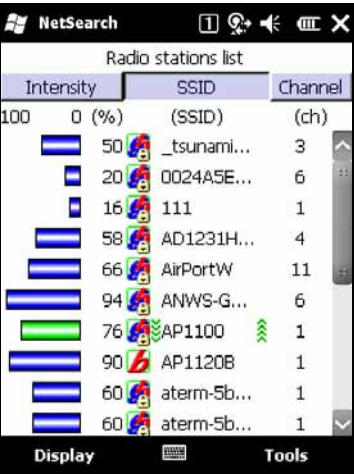- A key symbol icon is displayed for stations that use encrypted communication.

Figure 4-47

Table 4.14　Menus in the application

Menu		Description
Display		
	List View(1)	Displays a list of partner stations.
	Detail View(2)	Displays screen showing information in detail about the partner station.
	Options	Displays a screen for setting partner station parameters for searching.
	About	Displays version information.
	Exit(0)	Closes the NetSearch.
Tools		
	Ping(4)	Displays the Ping utility screen.
	Signal(5)	Displays the Signal screen.

Detail Information About Partner Station

The screen displays the following detail about the partner station.

- SSID
- WLAN standard
- No. of channels operable
- Intensity (%)
- Encryption
- MAC address
- Status
- IP address
- Physical address

Navigate to **Start** → **Programs** → **Communication** → **NetSearch** icon to initiate the screen.

Figure 4-48

Detail Button

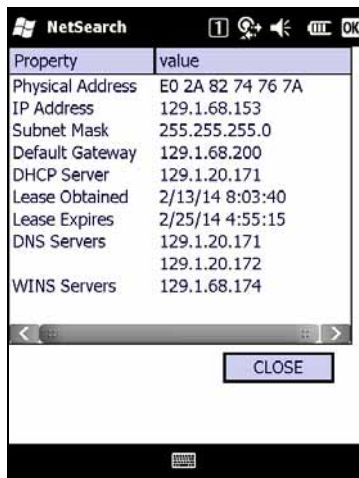This button displays the log of IP in detail.

Figure 4-49

Ping(U4U) Button

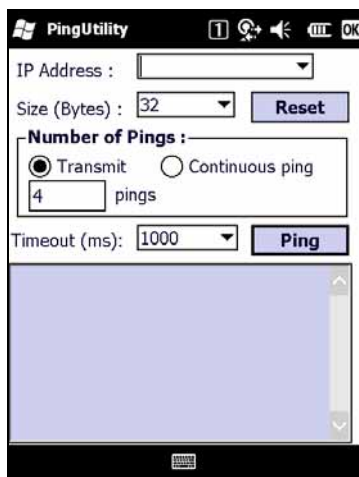This button (see Figure 4.45) displays the PingUtility screen.

Figure 4-50

Signal(U5U) Button

This button (see Figure 4.45) displays the signal strength in dBm and with a yellow straight line that also indicates the signal strength in percent for the operator to judge if the signal in air is ample enough to continue WLAN operation
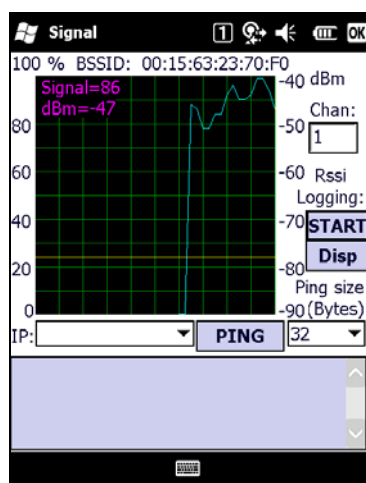
Figure 4-51

Options Screen

Navigate to **Start** → **Program** → **Communication** → **NetSearch** icon → **Display** and then choose **Options** in the menu to display the following screen.

Figure 4-52

Search conditions
Choose a partner station to be searched via a way of either **Only AdHoc** or **Only Accesspoint** or **Both**.

Search WLAN Standard
Choose a partner station to be searched via a WLAN standard either **802.11.b Support** (IEEE802.11b standard) or **802.11.g Support** (IEEE802.11g standard) or **Both**.

4.22 NFC Demo

Various demos related to scanning NFC cards are performed.
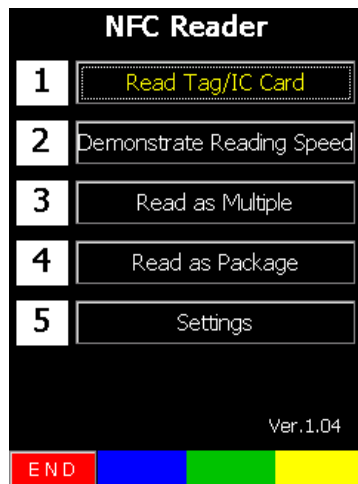
Figure 4-53

Read Tag/IC CARD
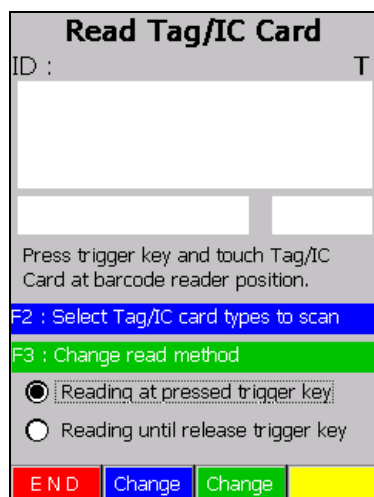
Figure 4-54
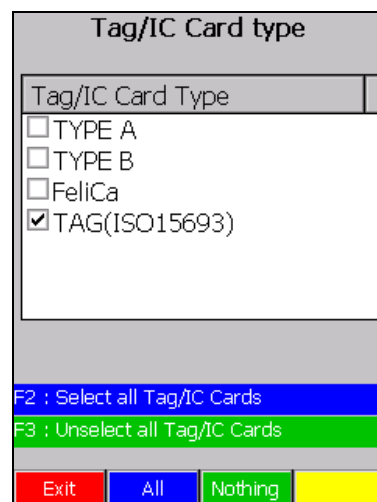
Figure 4-55

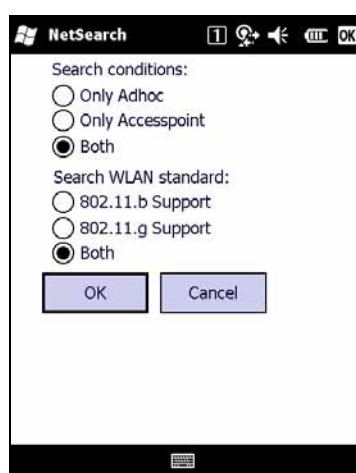When the trigger key is pressed, the NFC scanner scans the IC card/tag and displays the scanned data. Press the F2 key or the change screen button (blue) on the screen to change the type of card or tag to scan. Press the F3 key or the change screen button (green) on the screen to change the reading method. The following types of tag and IC card are readable:

✧ ISO/IEC14443TypeA(MIFARE Standard,UltraLight)
✧ ISC/IEC14443TypeB
✧ Felica
✧ ISO15693

Demonstrate Scanning Speed
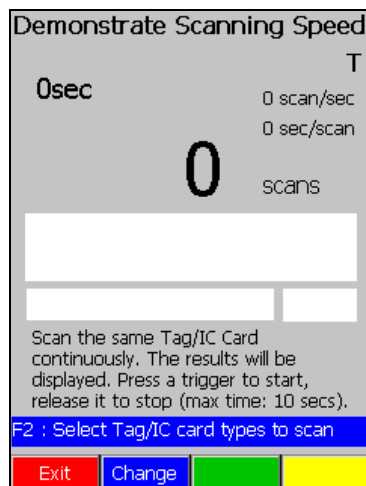
Figure 4-56
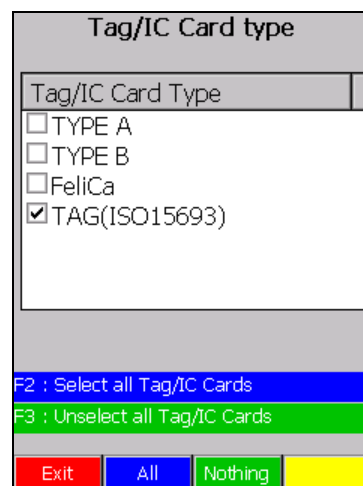
Figure 4-57

When the trigger key is pressed, the NFC scanner scans the same IC card/tag repeatedly, and you can experience how fast data is scanned repeatedly. Press the F2 key or the change screen button (blue) on the screen to change the type of card or tag to scan.

Read as Multiple
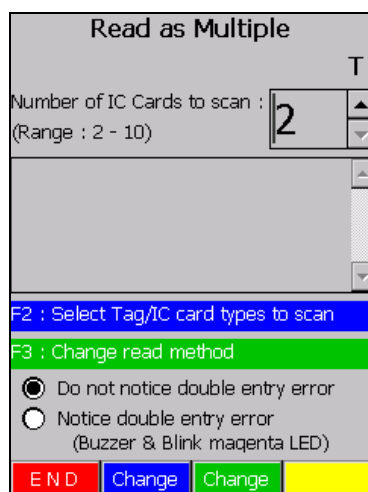
Figure 4-58
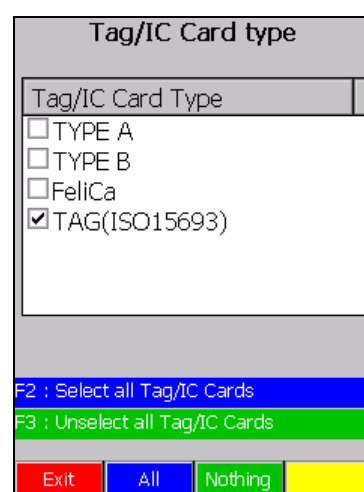
Figure 4-59

When the trigger key is pressed, the NFC scanner consecutively scans multiple IC cards or tags and displays the scanned data. Press the F2 key or the change screen button (blue) on the screen to change the type of card or tag to scan. Press the F3 key or the change screen button (green) on the screen to change scanning method.

Read as Package

Figure 4-60

Figure 4-61

When the trigger key is pressed, the NFC scanner scans multiple IC cards or tags as a batch and displays the scanned data. Press the F2 key or the change screen button (blue) on the screen to change the type of card or tag to scan.

Setting

Figure 4-62

Switch the settings of the scanning demonstration
Press the F2 key or the change screen button (blue) on the screen to change the volume setting to use during scanning.
Press the F3 key or the change screen button (green) on the screen to change whether the vibrator functions during scanning.

4.23 Notes

This application enables you to jot a quick note.
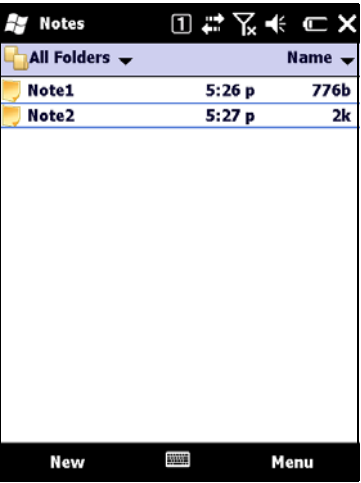
Figure 4-63

To create a new note, tap New.
To edit an existing note, tap the file name.

Table 4.15　Menus in the List view

Menu		Description
New		Creates a new note.
Menu		
	View Recording Toolbar	Shows or hides Recording Toolbar.
	Rename/Move	Renames or moves the selected notes.
	Delete	Deletes the selected notes.
	Create Copy	Creates a copy of the selected note.
	Select All	Selects all notes in the list.
	Send ...	Creates a new e-mail message with the selected note attached.
	Beam ...	Sends the selected note via　Bluetooth.
	Options ...	Sets up options for Recording.

Recording Toolbar
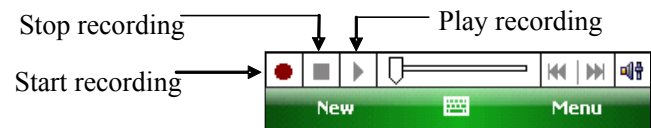
Figure 4-64

To begin recording, tap the Record button.
To end recording, tap the Stop button.

Editing Screen
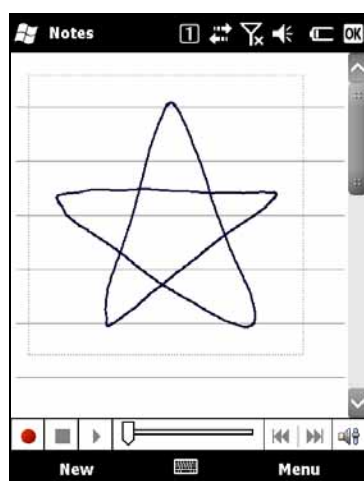
Figure 4-65

Table 4.16   Menus in the Editing Screen

Menu		Description
New		Creates a new note.
Menu		
	View Recording Toolbar	Shows or hides Recording Toolbar.
	Draw	Turns Draw mode on or off.
	Undo	Undoes the last action.
	Redo	Redoes the last Undo command.
	Cut	Cuts the selected items in the current note.
	Copy	Copies the selected items in the current note.
	Paste	Pastes the items that are cut or copied.
	Edit	
		Clear	Deletes the selected items in the current note.
		Select All	Selects all items in the current note.
	Zoom	Changes the display size.
	Tools	
		Rename/Move	Renames or Moves the current note.
		Delete	Deletes the current note.
		Send ...	Creates a new e-mail message with the current note attached.
		Beam ...	Sends the current note via or Bluetooth.

4.24 Notification Demo (Buzzer / Vibration)

This application is sound some different pattern buzzer and vibration.

Figure 4-66

4.25 Phone

This application enables you to mobile phone.

Figure 4-67

See the phone manual for detail.

4.26 Pictures & Videos

This application enables you to view and share digital pictures and videos.

Figure 4-68

To view picture and video clips, tap the respective clips.

To take a photo, do one of the following:
- Tap Camera icon.
- Tap **Camera** on the command bar.
- Navigate to **Menu** → **Camera**.

Table 4.17   Menus in the List view

Menu	Description
Camera	Initiates "Mobile Camera" application.
View	Displays the selected picture.
Menu	
Camera	Initiates "Mobile Camera" application.
Send ...	Creates a new e-mail message with the selected file attached.
Beam ...	Sends the selected file via or Bluetooth.
Save to Contacts ...	Attaches the selected picture to the Contact item.
Delete	Deletes the selected picture or video.
Edit	
Cut	Cuts the selected picture or video.
Copy	Copies the selected picture or video.
Paste	Pastes picture or video that are cut or copied.
New Folder	Creates a new folder.
Play Slide Show	Plays pictures as slide show.
Set as Today Background ...	Sets the selected picture as a Today's wallpaper.
Go to	
My Pictures	Opens My Pictures folder.
My Device	Opens root folder.
Folders ...	Opens specified folder.
Tools	
Properties	Displays the property of the selected file.
Sort By	
Name	Displays the list sorted by name.
Date	Displays the list sorted by date.
Size	Displays the list sorted by file size.
Options ...	Sets up options for Slide Show, etc.
Send to your space	Sends the selected file to your Windows Live space.

Viewing Screen

Figure 4-69

To edit the picture, navigate to **Menu → Edit**.

Table 4.18   Menus in the Viewing Screen

Menu			Description
Send			Creates a new e-mail message with the picture attached.
Menu			
	Zoom		Opens the sub window for zooming the picture.
	Play Slide Show		Plays pictures as slide show.
	Set as Today Background ...		Sets current picture as a Today's wallpaper.
	Beam Picture		Sends current file via Bluetooth.
	Save		
		Save to Contacts ...	Attaches current picture to the Contact item.
		Save As ...	Saves the picture with new name.
	Edit		Switches to the Editing Screen.
	Properties		Displays the property of current file.
	Options ...		Sets up options for rotation, etc.
	Send to your space		Sends current file to your Windows Live space.

Editing Screen

Figure 4-70

Table 4.19   Menus in the Editing Screen

Menu		Description
Rotate		Flips the picture 90 degree.
Menu		
	Crop	Crops the picture by drawing a box.
	Auto Correct	Adjusts the brightness and contrast levels of the picture.
	Undo	Undoes the last action.
	Revert to Saved	Reloads the last version of the image from the file.
	Save As ...	Saves the picture with new name.

4.27   Printer Demo

The equipped printer can be used to check the registered text, graphics, screens, stamps, foreign characters, etc. with various printer demos.
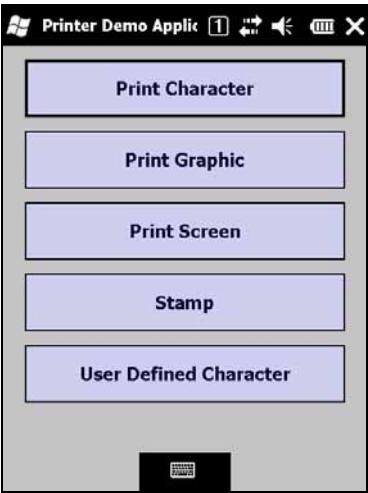
Figure 4-71

4.28 Remote Desktop Mobile

This application is the RDP6.0 based remote desktop client.

Figure 4-72

The following is the procedure.

1. Perform the following.
   - In **Computer,** enter the name of the computer to which you want to connect.
   - Enter your **User name** and **Password**.
   - Enter **Domain**, if required.
   - Select **Save password**.
2. Tap **Connect**.

To improve display performance for Remote Desktop Mobile, tap **Options** to select optimum parameters.

4.29 Search

The application can search for files and other items stored in the terminal in the My Documents folder or in a storage card.
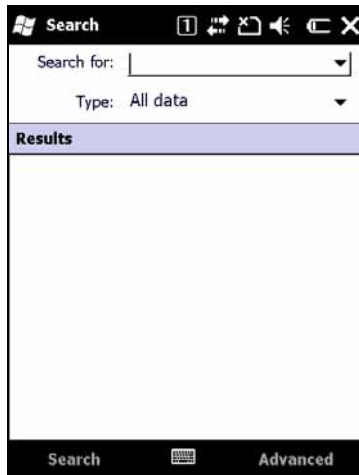
Figure 4-73

To search for a file or an item, follow the steps below.

1. Enter the file name, word, or other information you want to **Search for** field.
2. In **Type** pull-down menu, select a data type to help narrow your search.
3. Tap **Search**.

4.30 Task Manager

This application is used to view running tasks, switch tasks, and stop tasks.

See Chapter 3.26 "Task Manager" for detail.

4.31 Tasks

This application lets you keep track of jobs and tasks you need to do.

Figure 4-74

To create a new Appointment, tap **Tap here to add a new task** or navigate to **Menu** → **New Task**.

Table 4.20   Menus in the application

| Menu			Description
Complete			Marks the selected Task as completed.
Menu			
	New Task		Creates a new Task.
	Beam Task ...		Sends the selected Task via Bluetooth.
	Delete Task		Deletes the selected Task.
	Edit		
		Cut	Cuts the selected Task.
		Copy	Copies the selected Task.
		Paste	Pastes Task that are cut or copied.
	Options ...		Sets up options for Task.
	Sort By		
		Status	Displays Task list sorted by Status.
		Priority	Displays Task list sorted by Priority.
		Subject	Displays Task list sorted by Subject.
		Start Date	Displays Task list sorted by Start Date.
		Due Date	Displays Task list sorted by Due Date.
	Filter		
		All Tasks	Displays all Tasks.
		Recently viewed	Displays Tasks you have recently added, edited, or viewed.
		No Categories	Displays all Tasks with no category.
		Active Tasks	Displays all Tasks with a start date before and on the current date.
		Completed Tasks	Displays all Tasks marked completed.

4.32 Windows Live

You can use Windows Live on the terminal to find information on the web.
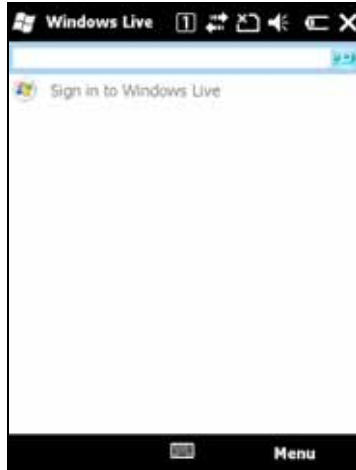You must have a Windows Live ID and password to use this service.

Figure 4-75

4.33 Windows Media

The terminal includes Windows Media Player Mobile, a program that plays music and videos. It can play media files that are stored on the terminal as well as songs and videos that you stream from the Internet.
The media player also plays streaming TV, if this service is available from your provider.
Windows Media Player Mobile also helps you organize your media files. After you save media files to your terminal, you can create playlists of both music and video files.

Windows Media Player Mobile gives you access to the following folders:
- My Music, which holds sound files downloaded to your terminal, and any files that you add.
- My Videos, which holds video files downloaded to your terminal, and any files that you add.
- My TV, which holds television programs downloaded to your terminal.
- My Playlists, which holds the playlists that you create.
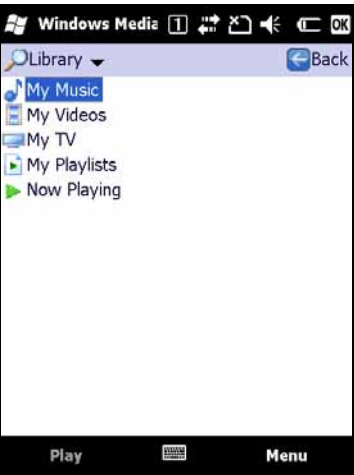
Figure 4-76

Table 4.21   Menus in the Library view

Menu		Description
Play		Plays the selected file.
Menu		
	Queue Up	Adds the selected file to the playlist.
	Delete from Library	Deletes the selected file from Library.
	Now Playing	Switches to Now Playing Screen.
	Library	Changes to another library.
	Update Library ...	Updates the library manually.
	Open File ...	Plays music or video stored in the terminal.
	Open URL ...	Plays music or video stored on the Internet.
	Properties	Displays the property of the selected file.

Playing Screen

Figure 4-77

Table 4.22　Menus in the Play Screen

Menu			Description
Now Playing			Switches to Now Playing Screen.
Menu			
	Library		Switches to Library view.
	Play/Pause		Starts or pauses the playing of a file.
	Stop		Ends the playing of a file.
	Shuffle/Repeat		
		Shuffle	Plays the playlist randomly.
		Repeat	Plays the playlist repeatedly.
	Full Screen		Hides the main menu, toolbar, etc.
	Options ...		Sets up options for playing.
	Properties		Displays the property of the current file.
	About		Displays version information.

Now Playing Screen
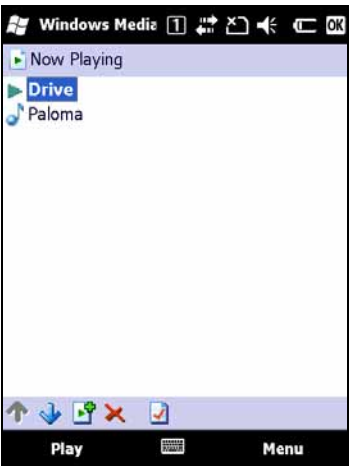
Figure 4-78

Table 4.23   Menus in the Now Playing Screen

Menu			Description
Play			Plays the selected file.
Menu			
	Library		Switches to Library view.
	Move Up		Moves the selected file up in the playlist.
	Move Down		Moves the selected file down in the playlist.
	Remove from Playlist		Removes the selected file from the playlist.
	Shuffle/Repeat		
		Shuffle	Plays the playlist randomly.
		Repeat	Plays the playlist repeatedly.
	Save Playlist		Saves the playlist.
	Clear Now Playing		Removes all items from the playlist.
	Error Details		Displays detail error message.
	Properties		Displays the property of the selected file.

4.34 LogViewer

4.34.1 Overview

The Logging Tool is a tool that the SE uses to analyze causes when a fault occurs. It can be used to view the following logs on the terminal.

- Execution logs
    The logs output by the application are called execution logs.
    Use the log output function to output execution logs.

- System logs
    These are logs output by the OS and drivers.

The logs are stored in the log file. They can be viewed using the terminal log viewer. At regular intervals (180 seconds), system logs collect logs that the system outputs to log memory and output them to the log file.
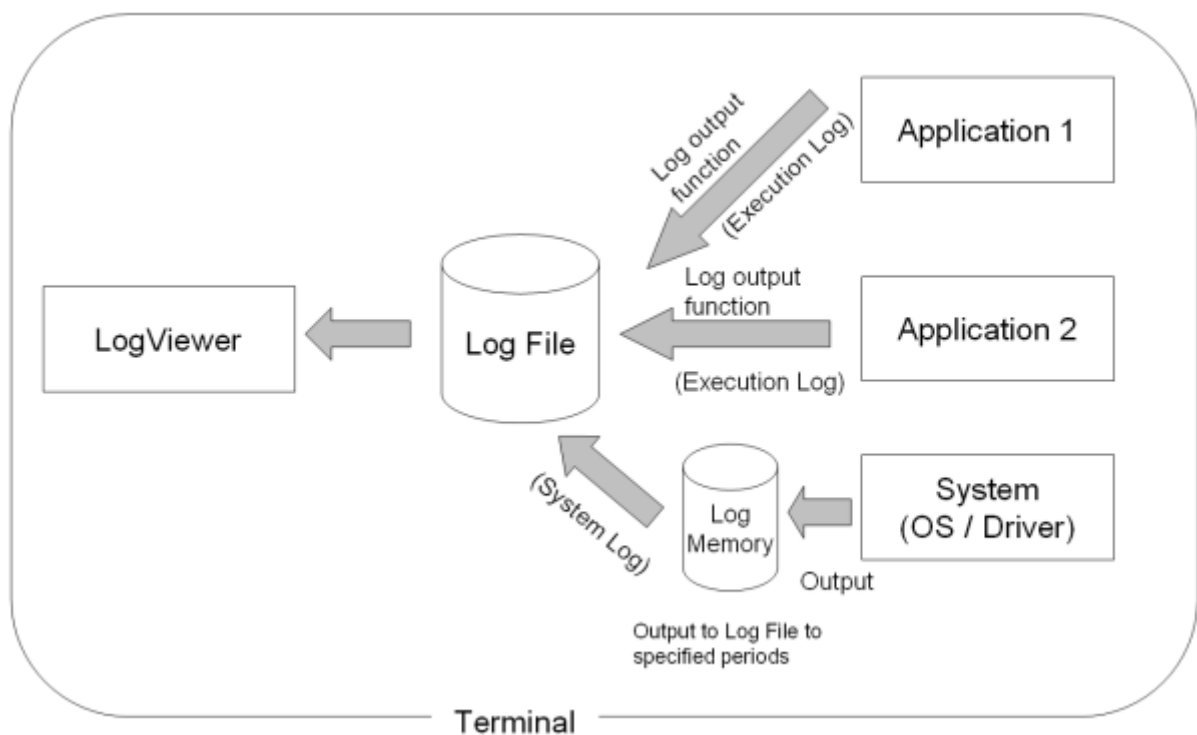
Output log information

The output log information is tabulated below.

No.	Item	Contents	System logs	Execution logs
1	Date and time generated	Date and time of log output		
2	Host name	Host name		
3	User name	In system logs, this is the name of the terminal owner. In execution logs, it is the user name.		
4	Device ID	The device ID for the terminal		
5	Models	The terminal model No.		
6	Build No.	The build No. of the terminal OS		
7	Service pack	The Version No. of the service pack		
8	Execution source	In system logs, this is the name of the output source process. In execution logs, this is the executable file name.		
9	Process name	In system logs, this differentiates between OS, drivers and boot.		
10	Log attribute	This differentiates between information, error and warning.		
11	Message	Output message		
12	Other terminal status	Status of each power supply type Power supply status CPU clock		
13	Terminal name	Name of log output source terminal		
14	Version No.	The version No. of the execution source		
15	Event type	This differentiates between start, progress and exit.		
16	Process ID	This is the ID of the process that output the log.		
17	Group ID	The parent ID of the process ID		
18	User identifier text	An identification text string defined by the user		
19	User-defined value	Flag information set by the user		

System Log Collection

System log collection is the function that collects logs that the system outputs to log memory, at regular intervals.

Start

Under the initial settings, a shortcut for System Log Collection (MoLogSys.exe) is registered in the Startup group (Log.lnk). It starts when the terminal is reset.

Stop

Run \Windows\MoLogStop.exe to stop system log collection.
Stop logging before using the backup tool to backup data.

4.34.2 Terminal Log Viewer

The Terminal Log Viewer has the following functions.

Functions	Overview
Subject range specification	Specify the time range for which to display logging files.
Display condition specification	Specify the range, in terms of other conditions, for which to display logging files.
List display	A summary of all logs subject to display is listed.
Details display	Detailed information is displayed for the log selected in the list display.
Export	Move or copy log files on the terminal into the specified folder.

Procedure

Start the terminal Log Viewer from Programs - Utilities - Terminal Log Viewer.

Screen transitions

The screen transitions are as follows:
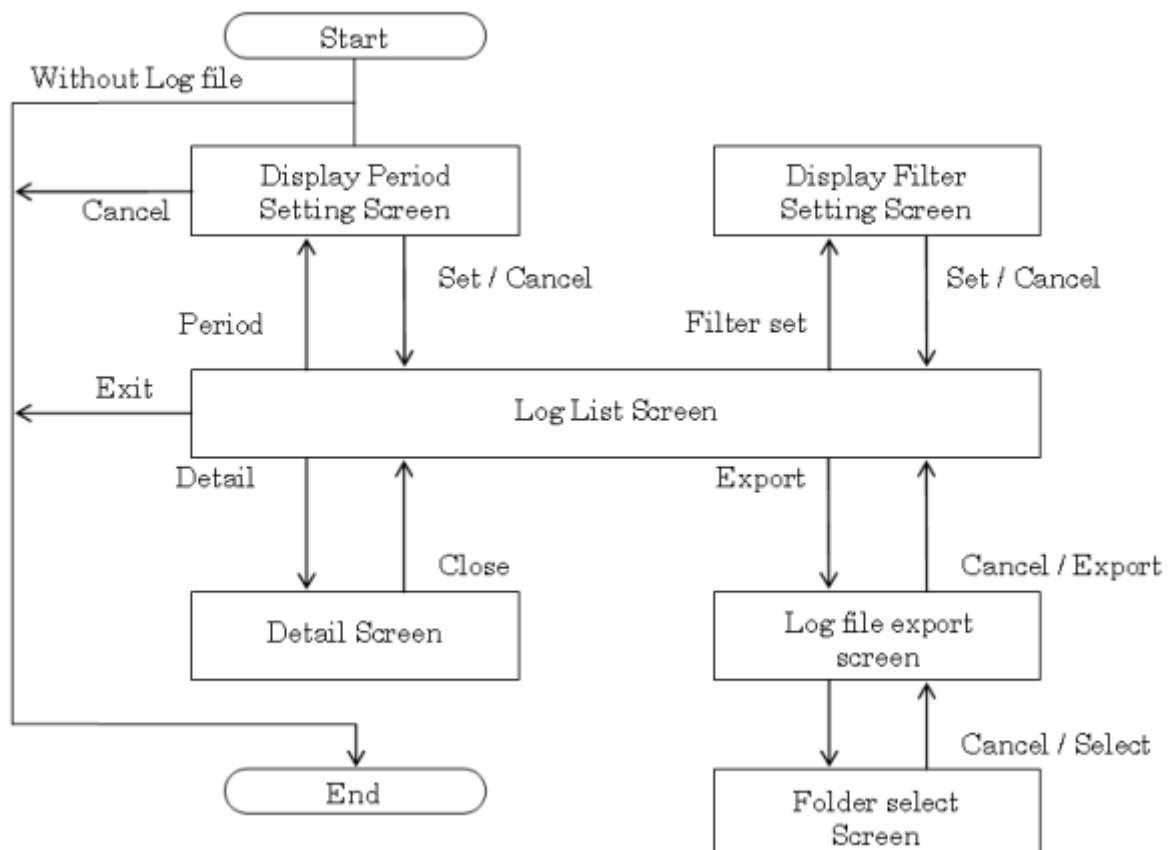
Displayed logs

The following logs are displayed on each screen.

No.	Item	Display condition setting	List	Details	Remarks
1	Date generated				*
2	Time generated				
3	Process ID				
4	Group ID				
5	Event type				
6	Host name				
7	Terminal name				
8	User name				
9	Execution source				
10	Process name				
11	Version No.				
12	Message				*
13	Log attribute				
14	Log type				
15	Device ID				
16	Models				
17	Build No.				
18	Service pack				
19	User identifier text				
20	User-defined value 1				
21	User-defined value 2				
22	User-defined value 3				

* Only the log selected on the List screen is displayed.

Display Range Settings screen

Use the Display Range Settings screen to specify the range of logs on the terminal to be loaded.
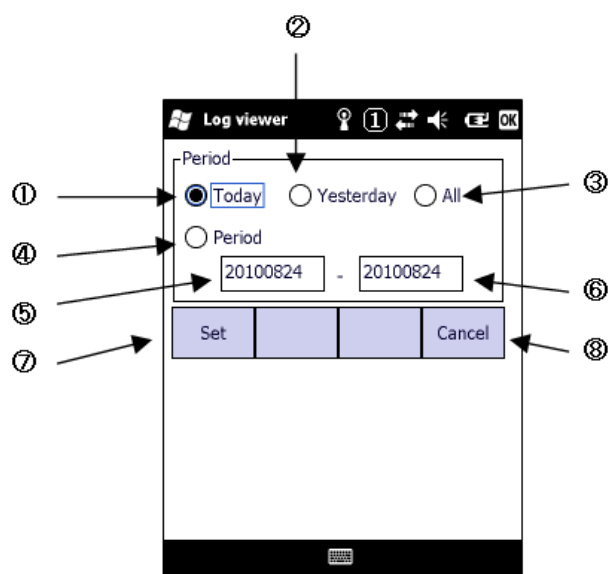
No.	Item	Contents
1	Today	Only display today　s logs.
2	Yesterday	Only display yesterday　s logs.
3	All	Display all logs on the terminal.
4	Period	Specify the period for display.
5	Start date	This applies to period specification. Specify the start date of the period in the format YYYYMMDD.
6	End date	This applies to period specification. Specify the end date of the period in the format YYYYMMDD.
7	Set	Enable setting content and display the list screen.
8	Cancel	Discard the settings and, if this is the startup screen, terminate the command. If this is displayed from the List screen, go back to that screen.

List screen

The List screen displays logs in a list format.
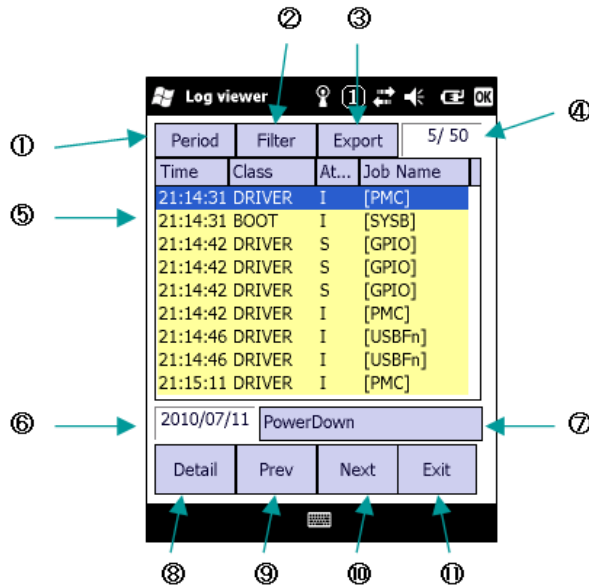
No.	Item	Contents
1	Period	Display the Display Range Settings screen and reload logs according to the conditions if the settings have changed.
2	Filter	Display the Display Conditions Settings screen and reload logs according to the specified conditions if the condition settings have changed.*
3	Export	Display the Log File Output screen.
4	Page display	Indicates the currently-displayed page and the total number of pages.
5	List	Display a list of logs matching the specified range or conditions. The list is displayed in page units, with one page being the range that can be displayed on one page.
6	Date and time generated	The date and time when the log selected in the list was generated are displayed.
7	Message	Any message concerning the log selected in the list is displayed.
8	Details	Opens a details screen for the log selected in the list.
9	Previous	This is enabled if the list extends to multiple pages and the second or later page is currently displayed. It displays the previous page.
10	Next	This is enabled if the list extends to multiple pages and the page currently displayed is not the last. It displays the next page.
11	Exit	Close the List Display screen and terminate the command.

* The text on the buttons varies as shown below, depending on whether or not there are set conditions.
No set conditions: "Filter"
Conditions have been set: "Change"

The display specification for the list area is as shown below.

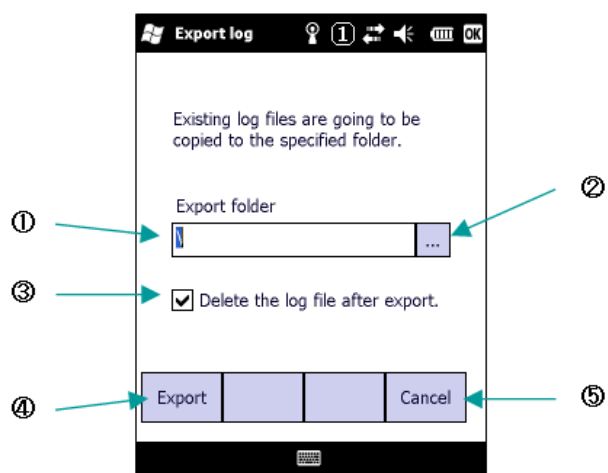| No.	Item	Contents
1	Time header	Sort the displayed logs by date and time generated, in ascending or descending order.
2	Class header	Sort the displayed logs by Class, in ascending or descending order.
3	Attribute header	Sort the displayed logs by attribute, in ascending or descending order.
4	Job name header	Sort the displayed logs by process name, in ascending or descending order.
5	Item area background color	Change the background colors used for the types of displayed logs. System logs : Yellow Execution logs : White
6	Time	The times the displayed logs were generated are displayed in the format HH:MM:SS. Double click on this item to display the Details screen.
7	Class	Indicates the types of logs on display clearly, with text and color. System logs are indicated as either "OS", "Driver" or "Boot". Execution logs are indicated as either "Information", "Start", "Normal termination", "Abnormal termination", "Progress" or "Other (value displayed)".
8	Attribute	The log attributes of the logs on display are clearly indicated by colors. One of the following is displayed: "I" : Information "W" : Warning "E" : Error "S" : Monitoring successful "F" : Monitoring failed
9	Job name	Indicates the Job name for the displayed log.

Display Condition Settings screen

Use the Display Condition Settings screen to specify which of the loaded logs to display.
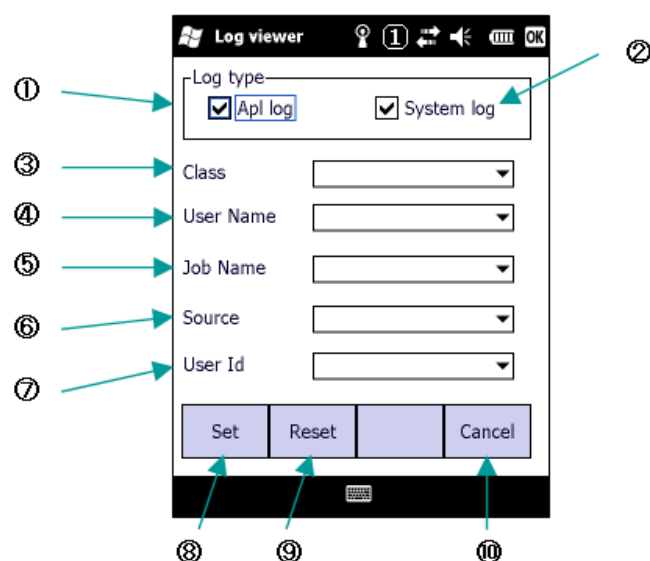
No.	Item	Contents
1	Execution logs	Specify display of execution logs. On: Display Off: Do not display
2	System logs	Specify display of system logs. On: Display Off: Do not display
3	Event Class	Specify event type conditions. Blank : Do not use as a condition Other : Extract according to the specified value
4	User name	Specify user name condition. Blank : Do not use as a condition Other : Extract according to the specified value
5	Job Name	Specify process name condition. Blank : Do not use as a condition Other : Extract according to the specified value
6	Execution source	Specify execution source condition. Blank : Do not use as a condition Other : Extract according to the specified value
7	User identifier	Specify user identifier condition. Blank : Do not use as a condition Other : Extract according to the specified value
8	Set	Set the specified content and go back to the list screen.
9	Reset	Cancel the set conditions and go back to the list screen.
10	Cancel	Discard the set content and go back to the list screen.

Log File Export screen

Use the Log File Output screen to move or copy log files to the specified folder.

No.	Item	Contents
1	Export destination folder	Specify the destination folder for copying or moving logs.
2	Folder Selection button	Display the Folder Selection screen and set the selection result as the output destination folder.
3	Delete check box	This is only enabled during offline operation. Check to move logs.
4	Export	Execute copying or movement.
5	Cancel	Close this screen with no further action.

Folder Selection screen

Use the Folder Selection screen to select the folder from which to copy or move log files.
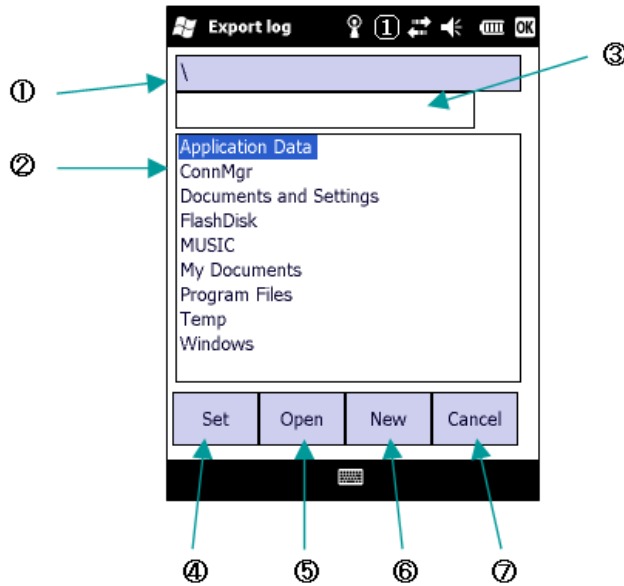
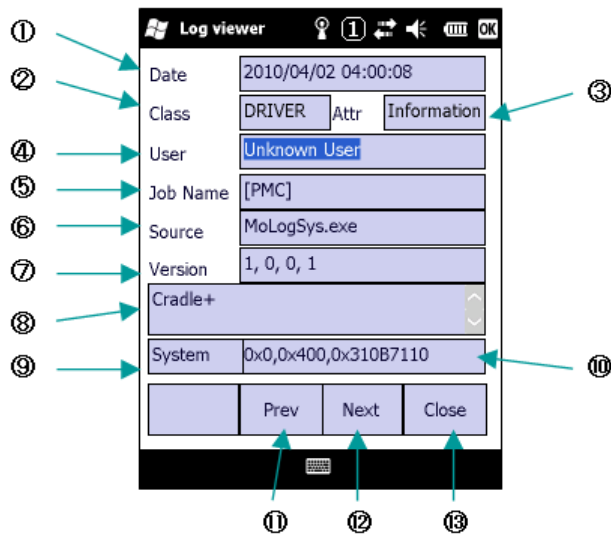| No.	Item	Contents
1	Selected path	Displays the path to the currently-displayed folder.
2	Folder list	Displays items for moving to higher-level folders and a list of folders existing at the current path. Double click on an item to move to the selected folder.
3	Input new folder	This is the input field for creating a new folder.
4	Set button	This enables the currently displayed and selected path and goes back.
5	Open button	This moves to the location selected on the folder list.
6	New button	This enables the Input New Folder area.
7	Cancel button	This discards the current settings.

Details screen

Opens a details screen for the the log selected in the list, and displays detailed information.

No.	Item	Contents
1	Date and time generated	Displays the generation time of the displayed log, in the format YYYY/MM/DD HH:MM:SS.
2	Event Class	Displays the event class of the logs on display clearly, in color and text. System logs are indicated as either "OS", "Driver" or "Boot". Execution logs are indicated as either "Information", "Start", "Normal termination", "Abnormal termination", "Progress" or "Other (value displayed)".
3	Attribute	Displays the attributes of the logs on display clearly, in color and text. One of the following is displayed: "I" : Information "W" : Warning "E" : Error "S" : Monitoring successful "F" : Monitoring failed Others Display values as they stand
4	User name	Display the user name for the displayed log.
5	Job Name	Displays the process name for the displayed log.
6	Execution source	Displays the execution source for the displayed log.
7	Version	Displays the version of the displayed log.
8	Message	Displays messages for the displayed log.
9	User identifier	Displays the user identifier for the displayed log, if one has been set.

10	User-defined Data	If there is any user-defined data for the displayed log, it is displayed with commas as separators.
11	Previous	Displays the previous log on the List screen.
12	Next	Displays the next log on the List screen.
13	Close	Closes this screen and displays the List screen.

Log Files

There are two types of log files:

- Output files
  The output file for the current log
  The storage folder is \FlashDisk\Molog (initial setting).
  If the specified capacity (initial setting is 40KB) is exceeded, the next setting is the backup file.

- Backup file
  This is the file to move data to if the specified capacity of the output file is exceeded.
  The storage folder is \FlashDisk\Molog\Backup (initial setting).
  If the total of the file sizes in the storage folder exceeds the specified capacity (initial setting is 120KB), log files are deleted, starting with the oldest.

Log Files have the following file names.

Item	Contents
Name	MoLog<YYYY><MM><DD>_<NNN>. csv*

<YYYY><MM><DD> is the date the file was generated.
<NNN> is a serial number (three digits, decimal) used in the event that multiple logs exist on the same day. It is a numerical string starting from "001". The number of files on the same date is limited to 999.

4.34.3 Customization

Terminal operation settings file

To customize, create the ini file below and reboot the terminal.

Item	Contents
Placement location	\FlashDisk\System Settings
File name	MoLog. ini

No.	Name	Contents	Default
1	Logging section		
2	Mode	Collection operation 0=Not processed 1=Offline	1
3	FileLimitSize	File size (bytes)	40KB
4	LogCapacity	File size waiting for processing (bytes)	120KB
5	LogFolder	Log file output destination folder	\FlashDisk\Molog
6	SendFolder	Folder for storing files awaiting processing	\FlashDisk\Molog\Backup
7	SysLogInterval	The system log collection interval (s) *	180

*　This is enabled for models which allow system log collection. Logs will not be collected if "0" is specified.

5. Utilities

The utilities listed in the table below are mainly used as a co-process or auxiliary program in user applications.

Table 5.1

Utility	Description	CASIO	MS
FCHKCE	Confirms a result of data upload/download.	Yes	--
Auto Setup	Carries out automatically application at time of reset on the terminal.	Yes	--
TextEditor	Rich text editor	Yes	--
CT Client	Measures the WLAN communication status.	Yes	--
DiskClean	Format user disk and initialize RAM as the same status of the factory prior to shipment.	Yes	--

MS; Microsoft

5.1 FCHKCE

This utility checks a result of data upload/download. See the LMWIN Utility manual for detail.

5.2 Auto Setup

This utility automatically sets up a specified application.

Execution Timing

The timing for executing "Auto Setup" is as follows.
When the terminal is reset;
The utility carries out **Setup.exe** in the FlashDisk.

Location of application for automatically starting up with Auto Setup

Location of applications to be automatically set up with this utility is **CE\ARM** folder of the
FlashDisk.

Customizing in the Registry

Performances of the "Auto Setup" can be automatically customized by changing the parameters in
the following registry.
[HKEY_LOCAL_MACHINE\Drivers\CASIO\UTIL]

Table 5.2

Key	Setting Value	Description
FLSETUP	sz: "1"	Carries out **Setup.exe** for the FlashDisk at a time of reset on the terminal.

Notes:
- Once the registry is deleted, the applicable application does not automatically start up.
- The registry is initialized to its factory setting by performing a full reset on the terminal.
- Since automatic startup of applications with the utility is performed every time when a reset is
  performed on the terminal, it should be avoided by controlling the automatic startup for each
  applicable application.

5.3 TextEditor

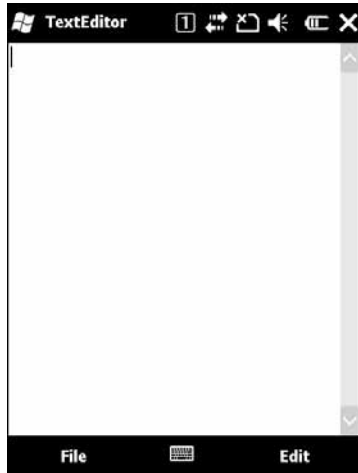This utility can display and edit text files such as log files and ini files.

Figure 5-1

Table 5.3　Menus in the application

Menu		Description
File		
	New	Creates new text.
	Open …	Displays existing document file.
	Save	Saves document file by overwritten.
	Save As …	Saves document file with a specified name.
	Recent Files	Displays recently displayed document file names.
	Version	Displays version information.
Edit		
	Undo	Restores the previous operation.
	Cut	Cuts document in the selected range.
	Copy	Copies document in the selected range.
	Paste	Pastes document specified for cut or copy.

5.4 CT Client

This utility performs status checking in the WLAN communication together with PC based server.

Note:
Refer to the "WLAN Survey Tool" manual for detail.

5.5 DSKClean

This utility formats the user disk and initializes RAM to the factory condition, and reloads OS again from OS disk. This procedure is called **User Disk Clean**. See "Reset" for detail.

Starting Up the User Disk Clean

1. Double tap **DSKClean.exe** located under Windows folder. Then screen shown in Figure 5.2 appears. Tap **OK** button to continue the rest of the operation.
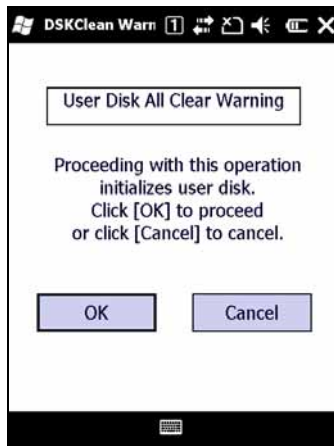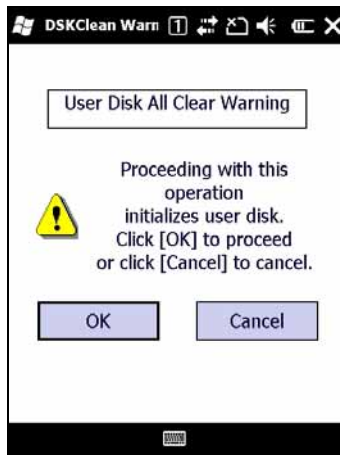

Figure 5-2

2. The screen below appears to confirm the operation. Tap **OK** button to continue.

3

Figure 5-3

3. The screen below appears, and then approximately 5 seconds later formatting the user disk and initializing RAM will automatically start.
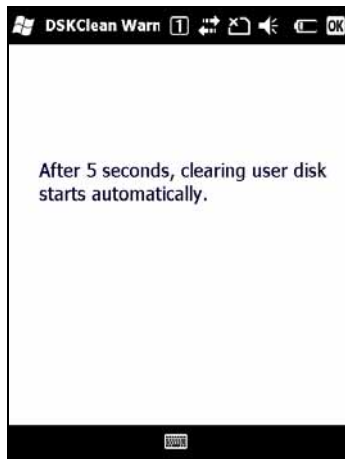

Figure 5-4

4. After formatting the user disk and initializing RAM are complete, the terminal suspends and then automatically reloads the OS from the OS disk.

6. PC Application Programs

The following are applications run on the host PC which is linked to the terminal via cradle.

Table 6.1

Application	Description	CASIO	MS
ActiveSync	Carries out data link with the terminal.	--	Yes
Windows Mobile Device Center	Carries out data link with the terminal.	--	Yes
LMWIN	Carries out data upload/download.	Yes	--
FCHK	Checks and confirms a result data upload/download.	Yes	--

MS; Microsoft.

6.1 ActiveSync

By linking with the ActiveSync client installed in the terminal, this utility makes communication with the terminal possible. It is available from the following site.
http://www.microsoft.com/windowsmobile/activesync/activesync45.mspx

Note:
Be sure to download the version 4.5 or later of ActiveSync for the operations described in this reference manual.

6.2 Windows Mobile Device Center (WMDC)

The Windows Mobile Device Center ("WMDC") performs data communication with the terminal. Window Vista users can use the WMDC to connect the terminal to PC (users of Windows XP and all previous operating systems should refer to Chapter 6.1 ActiveSync).
The Windows Mobile Device Center (WMDC) can be downloaded at the URL below.
http://www.microsoft.com/windowsmobile/devicecenter.mspx

Notes:
- The terminal cannot establish connection via the Windows Mobile Device Center without first modifying its factory settings. In order to establish connection, it is necessary to use the USB connection configuration tool to change the terminal's settings when connecting the terminal to PC.
- Be sure to use Windows Mobile Device Center 6.1 or later version. An earlier version of the WMDC does not support the IT-9000 and other Windows Mobile OS devices.

6.3 LMWIN

This utility interoperates with the FLCE installed in the terminal to perform data upload and download. It is an option available separately. See LMWIN Utility manual for detail.

6.4 FCHK

This utility checks and confirms results of data upload/download. See LMWIN Utility manual for detail.